BULLETIN OF THE HISTORY OF MEDICINE

ORGAN OF
THE AMERICAN ASSOCIATION FOR THE HISTORY OF MEDICINE
AND OF
THE JOHNS HOPKINS INSTITUTE OF THE HISTORY OF MEDICINE

Founded by HENRY E. SIGERIST

Editor—OWSEI TEMKIN

Assistant Editor—C. LILIAN TEMKIN

ADVISORY EDITORIAL BOARD

WYNDHAM B. BLANTON (No. 1) ESMOND R. LONG
GEORGE W. CORNER GENEVIEVE MILLER (Nos. 2-6)
A. EARL WALKER

VOLUME XXXIV

BALTIMORE
THE JOHNS HOPKINS PRESS
1960

COPYRIGHT, 1960 BY THE JOHNS HOPKINS PRESS

TABLE OF CONTENTS

PAGE

Frontispiece and Note 1

A Boyhood Portrait of William Stewart Halsted (1852-1922): Alfred Blalock 195

Main Articles

Bibliographical Notes on Medieval Muslim Dentistry: Franz Rosenthal 52

The First Cholera Epidemic and Social History: R. E. McGrew 61

Infant Management in the 18th Century with Special Reference to the Work of William Cadogan: John Rendle-Short 97

The *Accumulationes Receptarum* of Joannes Piscis: C. H. Talbot 123

Pathology at The New York Hospital, 1810-1932: Charles T. Olcott 137

Influences on the Founder of The Johns Hopkins University and The Johns Hopkins Hospital: Franklin Parker..... 148

A Survey of Some British Veterinary Folklore: T. D. Davidson 199

Thomas Linacre, 1460-1524: An English Physician Scholar of the Renaissance: William D. Sharpe..... 233

Cellular Pathology and the Development of the Deficiency Disease Concept: Richard H. Follis, Jr..... 291

De Sanguine Episcopoque: L. R. C. Agnew..... 318

The Cause of Cholera: Aspects of Etiological Thought in Nineteenth Century America: Charles Rosenberg..... 331

Hippocratic Description of Metabolic Diseases in Relation to Modern Concepts: Rudolph E. Siegel..... 355

Studies on the History of the Cardiovascular System: A. Rupert Hall 391

A Humanist Describes and Prescribes: Thomas Wilson and Medicine: Albert J. Schmidt..... 414

PAGE

Harvey's Doctrine in Italy: Argoli (1644) and Bonaccorsi (1647) on the Circulation of the Blood: WALTER PAGEL and F. N. L. POYNTER 419

Measles in Fact and Fancy: SAMUEL X. RADBILL and GLORIA R. HAMILTON 430

Walter S. Sutton and the Physical Basis of Mendelism: VICTOR A. MCKUSICK 487

Dominique Anel and his Operation for Aneurysm: D. DE MOULIN 498

AMERICAN ASSOCIATION FOR THE HISTORY OF MEDICINE: Thirty-Second Annual Meeting (Cont'd.):

SYMPOSIUM ON THE HEART

Some Significant Advances in Cardiac Physiology During the Nineteenth Century: CARL J. WIGGERS 1

The History of Methods for the Diagnosis of Heart Disease (a résumé): VICTOR A. MCKUSICK 16

History of the Treatment of Heart Disease in the Nineteenth Century: HAROLD FEIL 19

The Historical Development of the Surgical Treatment of Heart Disease: GEORGE A. H. CLOWES, JR. 29

The William Osler Medal Essay: Antyllus and His Medical Works: RICHARD L. GRANT 154

The Development of the Knowledge of Kidney Function in Relation to Structure—Malpighi to Bowman: L. G. WILSON .. 175

AMERICAN ASSOCIATION FOR THE HISTORY OF MEDICINE: Report of the Thirty-Third Annual Meeting, Charleston, South Carolina, March 24, 25, and 26, 1960 443

PAGE

TEXTS AND DOCUMENTS

Locke's Essay on Respiration: KENNETH DEWHURST 257

A Seventeenth Century London Plague Document in the Wellcome Historical Medical Library: F. N. L. POYNTER and W. R. LEFANU 365

An Unpublished Letter from G. K. Lawrence to C. S. Rafinesque, October 8, 1828: ALEX BERMAN 461

Realdo Colombo: "On Those Things Rarely Found in Anatomy." An Annotated Translation From the *De Re Anatomica* (1559): ROBERT J. MOES and C. D. O'MALLEY 508

NOTES AND COMMENTS

A Postscript to "Merrem's Youthful Dream": OWSEI TEMKIN 74

The Philadelphia Journal of the Medical and Physical Sciences 1820-1827: CHARLES L. LOSACCO 75

Paracelsus and Techellus the Jew: WALTER PAGEL 274

BIBLIOGRAPHIES

Bibliography of the History of Medicine of the United States and Canada—1959: GENEVIEVE MILLER 529

THE JOHNS HOPKINS INSTITUTE OF THE HISTORY OF MEDICINE:

Report of its Activities, During the Academic Year, 1959-60: OWSEI TEMKIN 566

MEDICO-HISTORICAL NEWS AND ACTIVITIES

Correspondence and Reports

Bernard Gordon Manuscripts in the United States (Thomas Herndon) 80

Editorial 81

Wu Lien-Teh, 1879-1960 (Ilza Veith) 278

PAGE

Deaths of Dr. John Fulton and Dr. Charles Singer 278

W. W. Francis, 1878-1959 (Lloyd G. Stevenson)..... 373

Charles Joseph Singer (1876-1960), D. Litt., M. D., Hon. D. Sc. Oxford, F. R. C. P. Lond. (Zachary Cope)..... 471

Announcements 82, 182, 279, 379, 474, 570

Book Reviews 85, 185, 280, 382, 476, 574

Contributors to this Volume.....96, 194, 290, 390, 486, 584

Index of Names—Volume XXXIV 585

BULLETIN OF THE HISTORY OF MEDICINE

ORGAN OF
THE AMERICAN ASSOCIATION FOR THE HISTORY OF MEDICINE
AND OF
THE JOHNS HOPKINS INSTITUTE OF THE HISTORY OF MEDICINE

VOLUME XXXIV JANUARY–FEBRUARY, 1960 NUMBER 1

SOME SIGNIFICANT ADVANCES IN CARDIAC PHYSIOLOGY DURING THE NINETEENTH CENTURY *

CARL J. WIGGERS

I assume the role of medical historian with the spirit of humility, for I realize that the qualifications for this task are quite different from those of an investigator. Research is concerned with the present and aims for the future; it deals with proximate and tangible situations. History looks back to the past and must depend upon secondhand information about persons and events. These two basic attributes mix no better than oil and water. Attempts of an investigator to emulsify them by his own experience result only in a cloudy solution. When this is boiled down to a 30 minute discourse, it is apt to become an amorphous mass, rather than a crystallization of thought.

Since these facts cannot be altered, I have chosen to limit myself to a few advances in cardiac physiology that appeared significant to me at the beginning of the present century. At that time I was inclined to regard accretions to our knowledge more important than the men who made them. I regarded medical historians as "long-hairs," too greatly inclined toward hero worship, and I looked upon investigators as containers of energy that they released in kinetic form and transmitted to future generations without decrement. However, as we mature and age, we tend

* Read at the "Symposium on the Heart," American Association for the History of Medicine, thirty-second annual meeting, Cleveland, Ohio, May 22, 1959.

to become collectors; we come to appreciate the flasks that once contained energizing fluids—perhaps, because we realize that memorialization is the only certain form of immortality. But, unless societies such as this grow in geometric progression with the rapid turnover of investigators, we may anticipate only a survival of an anonymous history of developments.

The Scientific Atmosphere

In its modern connotation, Physiology is a young science. It germinated in Leyden during the early eighteenth century in the "Institutes of Medicine" of the illustrious Boerhaave (1668-1738). The young plant, believed to belong to the genus, *Anatomia animata,* was tended and watered by John Hunter (1728-1793) of London. It was pruned by the great Albrecht v. Haller (1708-1777) of Göttingen and Bern and thus developed a sturdy stalk with a vigorous physiological branch.

At the turn of the century it began to be realized that chemical and physical forces were concerned in living processes, but, following François X. Bichat (1771-1802), these were believed to be subservient to a vital force incapable of human analysis. Early in the nineteenth century the romantic approach to physiology began to change to an empiric one. For instance, François Magendie (1783-1855) in Paris became weary of explaining the unexplainable by the assumption of a vital force and, lacking better interpretations, wisely contented himself with gathering isolated facts by experimental methods and left correlations to posterity. By contrast, Claude Bernard (1813-1878), who succeeded Magendie at the Collège de France in 1848, had the faculty of blending experimental data with constructive imagination and of formulating general principles applicable alike to general physiology and to clinical science. Realizing the difficulties of establishing chemical and physical explanations of life processes as advocated by German contemporaries, he sought biological approaches through experimentation. During convalescence from a serious illness he meditated on the basic rules he had followed during his early productive years (circa 1843-1864), and these reflections eventuated in his monograph, *An Introduction to the Study of Experimental Medicine* (1865—Translated into English by H. C. Greene, 1927). Through personal contacts and by his writings, Bernard profoundly influenced the trend of experimentation during the latter part of the nineteenth century.

The dawn of the nineteenth century witnessed the birth of two men who proved to be the progenitors of many celebrated physiologists. They were William Sharpey (1802-1880)· the first full-time professor of

anatomy and physiology in England (1836), and Johannes Müller (1801-1858), the all-round naturalist of Bonn and later the founder of the Berlin School of Physiology. Neither of them contributed materially to cardiac research, but they motivated pupils who determined the directions in which cardiac research was to move.

Status of Cardiac Physiology in 1840

For expediency, I have chosen to begin this survey with the status of physiologic knowledge as presented in Müller's *Handbuch der Physiologie des Menschen* (1833-1840), the first volume of which appeared at the time of his transfer from Bonn to Berlin. It is generally conceded by historians that this work was a worthy successor to the encyclopedic work of Haller (1759-1766) and the treatise of Magendie (1816-1817). These early textbooks of physiology became classics because of their comprehensiveness, their critical evaluation of current data, and their disdain of all tricks for creating a popular demand.

While Müller devoted considerable space in his *Handbook* to descriptions of the structure of the heart and blood vessels, he presented an account of the dynamic mechanisms concerned in ventricular filling and ejection that is highly commendable, considering that as yet no attempts had been made to record intracardiac pressures. He analyzed the movements of the heart, the origin of the apex beat, the action of cardiac valves, and the cause of the two heart sounds in accord with available information. He mentions the introduction of the mercury manometer by Jean L. M. Poiseuille (1799-1869) and his extension of hemodynamic studies inaugurated by Stephan Hales (1677-1761). Müller stressed the then recent physical studies of Ernst H. Weber (1795-1878) and his brother, Eduard (1806-1871) of Leipzig, who analyzed the pulse as a form of wave motion (1825) and compared the elastic aorta to a *Windkessel* of a fire engine.

The Cause of the Heartbeat and Role of Cardiac Nerves

The cause of the heart beat has always been one of the fascinating problems of nature. Müller did not condone the reckless experimentation on animals in vogue among French physiologists, but he reviewed the experiments of Legallois (1812), Philip (1822), Flourens (1824), and Marshall Hall (1831), objectively, and concluded that Legallois' concept of a controlling spinal motor center for the heart required restatement. The fact that the excised frog heart continued to beat for some time clearly

indicated the intrinsic nature of its rhythm. Since the beat, after its cessation, could be revived by passage of a weak constant current, Müller endorsed the view that cardiac nerves supply a similar continuous stimulation and that this maintains an intrinsic beat in the body. He concluded, " The cardiac nerves concerned are partly the vagi with their admixture of Accessorius fibers and partly the first thoracic ganglia of the sympathetic system."

During the years immediately following the publication of Müller's *Handbook,* two histologic discoveries might have suggested a myogenic origin and spread of cardiac contractions, but for the lack of evidence that muscle tissue could contract automatically. Friedrich W. Bidder (1810-1894), a pupil of Müller, discovered that cardiac muscle fibers branch and intercommunicate thus forming a continuum. Jan E. Purkinje (1787-1869) described the presence of the distinctive muscle cells that are named after him (1846). It may be added in passing that the contributions of this celebrated Czech physiologist are too often overlooked. In 1839 he founded in Breslau the first enduring European Institute of Physiology which remained an important training and research center under his direction until his return to Prague in 1850.

The discovery by Robert Remak (1815-1865) also a pupil of Müller, that the sinus venosus of the frog heart contains ganglion cells aroused more interest, because it had been demonstrated that excitation of respiratory muscles occurs through rhythmic discharges of nerve cells in the medulla. The concept that the cardiac beat originates in the cells of Remak's ganglion was strengthened in 1852 by an experiment described by Hermann Stannius (1808-1883). He found that the application of a ligature around the sinoatrial junction of the frog heart stopped atrial and ventricular contractions while the sinus beat persisted. Furthermore, a second ligature around the atrioventricular junction, for some obscure reason, induced a resumption of ventricular beats. After additional personal investigation of the phenomenon, Conrad Eckhard (1822-1902) in Giessen suggested that the " second ligature of Stannius " enhances the excitability of Bidder's ganglion cells, as nerves do in the body. The hypothesis of an intrinsic neurogenic origin of the heart beat thus launched dominated physiological thinking for the next forty years.

The manner in which cardiac nerves affected the intrinsic cardiac rhythm was not established with certainty until apparatus became available for producing repetitive electric shocks. Profiting from Faraday's discovery (1831), the Weber Brothers designed a rotatory electromagnetic induction machine and, in 1845, demonstrated that application of a faradic

current to the vagus nerves or to their approximate site of origin in the brain stem caused slowing or arrest of the heart. Since Julius L. Budge (1811-1880) demonstrated the same effect of faradic excitation independently and almost concurrently, the enduring fame of the Weber brothers rested not on the slight priority of their report but on their perspicacity in deducing that nerves can exert a suppressing as well as an excitatory effect on visceral activities. Thus was born the concept of inhibition which has revolutionized our thinking with regard to nervous actions and other physiological processes. Credit for priority of discovery belongs not to the investigator who merely " sees " a phenomenon but to the one who " sees through it."

It is not surprising that, true to the principles of research, many investigators should seek other explanations for vagal arrest that were more consonant with the thinking of the period. For example, Moritz Schiff (1823-1896), a pupil of Magendie, strongly defended the view that the vagi are motor nerves and that cardiac arrest occurs because strong stimulation induces fatigue and thus blocks normal impulses. While this view proved untenable, the controversy aroused did warn investigators that reactions elicited by nerve stimulation may not represent the effects they mediate in the body.

In 1862 Albert v. Bezold (1826-1868), then at Jena, reported that faradic stimulation of the cephalic end of the sectioned thoracic cord caused cardiac acceleration and a rise in mean blood pressure. This demonstration was possible through Ludwig's previous invention of the recording mercury manometer and kymograph (1847). Following Ludwig's criticism that the elevation of blood pressure might have been responsible for the cardiac acceleration, rather than the reverse, v. Bezold continued his experiments after his transfer to Würzburg and, in 1867, demonstrated that the acceleration was primary and mediated by sympathetic fibers via the stellate ganglion.

At this point, it is difficult for a person brought up on the lore of the Leipzig Institute of Physiology to refrain from expanding on the great influence that its founder and director, Carl Ludwig (1816-1895), exerted upon the whole field of cardiovascular physiology. It must suffice to recall that he held professorships successively at Marburg (1846-1849), Zurich (1849-55), and Vienna (1855-1864), before he succeeded E. H. Weber as professor of physiology at Leipzig. Here he designed a new institute, opened in 1867. Ludwig's technical skills, his capacity for designing new approaches, and his sincere, genial, and unselfish disposition soon became so widely known that every aspirant

for a career in physiology considered it almost obligatory to spend at least a year as his apprentice.

Soon after his transfer to Leipzig, Ludwig was joined by the Russian physiologist, Elie Cyon (1843-1912). Working with his brother M. v. Cyon, he showed that the sympathetic accelerator effect is abrogated by excision of the stellate ganglion, and, in conjunction with Ludwig, he discovered the depressor nerve in rabbits. This and the observations of v. Bezold and O. Hirt (1868) that veratrine causes bradycardia and hypotension were the first indications that nerves originating in the vicinity of the heart can modulate heart rate and blood pressure reflexly. In 1871, Oswald Schmiedeberg (1838-1921), later director of the pharmacological institute at Strassburg, mapped out the pathway of sympathetic accelerator fibers in dogs. It is not generally recalled that the eminent Russian physiologist, Ivan Pavlov (1849-1936), also worked in Ludwig's institute and, after his return to St. Petersburg, engaged upon a number of cardiac researches. In 1887, he reported that stimulation of some cardiac sympathetic strands resulted in augmented ventricular contractions. This has been confirmed repeatedly, notably by François-Franck (1890), Roy and Adami (1892), and in our country by Howell and Dukes (1896) and Reid Hunt (1897). Thus, at the close of the century, Foster's *Textbook of Physiology* could state authoritatively, "In the mammal then as in the frog, the heart is governed by two sets of nerves, the one antagonistic to the other."

Mention of this popular textbook recalls to us that Sir Michael Foster (1836-1907) was a pupil of Sharpey at University College, London, and directed the laboratory of physiology at Cambridge from 1853 to 1903. He was not only a stimulating teacher and writer, but also a "talent scout" for pupils who brought physiological research in England up to par with that on the continent.

Incidentally, the contribution of English physiologists during the latter half of the nineteenth century is ably reviewed in Schäfer's comprehensive *Textbook of Physiology* (1898-1900). Edward Schäfer, later Sir Edward Sharpey-Schafer (1850-1935), was another distinguished pupil of Sharpey, and became his successor at University College in 1882, a position he held until his appointment at Edinburgh in 1899. His observations with Oliver, in 1895, of the amazing pressor and cardiac effects of extracts of the adrenal glands opened many new frontiers in cardiovascular physiology.

Of Foster's many pupils, Walter H. Gaskell (1847-1914) was one of the most distinguished. The inspiration that he received from Foster has

been well documented; but his incentive to study the "meaning of the heart beat" must have been influenced by his stay in Ludwig's institute during 1874. Here Henry P. Bowditch of Boston (1840-1911) had discovered the "Law of All or None" and the phenomenon of "Treppe" only a few years previously. Here also were performed experiments, which Bowditch published after his appointment at Harvard (1872), showing that the apex of the frog's heart devoid of ganglion cells can beat rhythmically when perfused with serum under pressure. In 1874, Luigi Lucianni (1840-1919), an Italian pupil of Ludwig, described the periodic rhythm that bears his name. During Gaskell's year in Leipzig, Hugo Kronecker (1839-1914) "the soul of the Leipzig Institute," showed that the frog's heart is refractory to stimulation during systole. At the same time, Ludwig was engaged with his pupil Merunowicz in studying the specific constituents of blood required to maintain the heart beat. Their procedure of eliminating or adding various components of blood to perfusion fluids was followed by many subsequent workers and, during 1880 to 1883, led to Sidney Ringer's (1835-1910) discovery that a buffered solution containing a proper balance of Na, K and Ca ions suffices to maintain the beat of perfused frog hearts.

After his return to Cambridge, Gaskell introduced the suspension method for recording cardiac contractions in frogs and turtles. Largely through results obtained by this simple method during the years 1882 to 1887 he concluded:

1) that cardiac beats depend on the rhythmic release of impulses by muscle cells—not ganglion cells—in the large veins or sinus venosus;

2) that, owing to biological differences, other regions can generate impulses at slower rates, regardless of the presence of ganglion cells;

3) that the contraction wave spreads over atria and ventricle by muscular tissue at rates of speed which vary in different regions; and

4) that their passage from atrium to ventricle may be impeded or prevented by mechanical compression (heart block). It may here be pointed out that in 1884 Robert Tigerstedt (1853-1923), while working in Ludwig's laboratory, induced independent atrial and ventricular rhythms in mammalian hearts by crushing the border of the atrium with an atriotome. He thus extended Gaskell's observations on A-V block and independent ventricular rhythmicity to mammalian hearts. In Ludwig's laboratory, Tigerstedt also became interested in other circulatory problems that remained his chief interest after his appointment to chairs of physiology, first in Stockholm (1886-1900) and later in

Helsingfors (1900-1919). His incomparable review, the *Physiologie des Kreislaufes* (1921-1922), and the *Handbuch der physiologischen Methodik* (1908-1914), which he edited, are well known to all physiologists.

Gaskell also investigated the mechanism of vagal inhibition. He showed that vagal excitation not merely decreases the rate of impulse initiation, but also retards impulse conduction and diminishes the force of atrial contractions. He suggested that inhibition is not basically a depression of cellular activity, but a conservative anabolic process. These investigations supplied him with the incentive for investigating other visceral nerves, and the results were published posthumously as a monograph, *The Involuntary Nervous System* (1916).

In 1863, Franz C. Donders (1818-1889) was appointed to the chair of physiology at Utrecht, after membership on the Faculty of that University for 15 years. Of course, Donders achieved his greatest distinction in the fields of physiological optics and ophthalmology, but he made a number of isolated discoveries in cardiac physiology. For instance, he showed that cardiac acceleration takes place mainly at the expense of diastole and that sudden filling of the coronary arteries may be a subsidiary mechanism in ventricular relaxation and filling (1859). His observation in 1850 that atrial and ventricular muscles are completely separated by a fibrous ring caused much embarrassment for four decades to those who advocated muscular transmission of contraction waves in mammalian hearts, that is until Wilhelm His, Jr. (1863-1934) described an A-V bundle in 1893 and two years thereafter showed that its destruction leads to dissociation of atrial and ventricular beats.

In 1866 Donders designed a new Institute of Physiology at Utrecht, the second one in Europe. In 1868, he chose Theodore Engelmann (1843-1910), a pupil of v. Bezold, as an assistant. Four years later, Engelmann was promoted to a professorship, and in 1873 he was elected Donder's successor as Director of the Institute. This position he held until 1897 when he was chosen successor to du Bois-Reymond in Berlin.

Engelmann's researches started with a study of the rhythmic activity of cilia. These studies prompted him to investigate the rhythmic peristaltic waves of the ureters. Having, as he believed, shown that smooth muscle can originate contraction waves, he considered the possibility that cardiac muscle may have a similar rhythmic property. His experimental work, begun about 1880, supported and extended that of Gaskell, and he became the protagonist of the myogenic theory in Germany. Indeed continental

writers were as inclined to attribute the validation of the myogenic theory to him as English writers were to assign the whole credit to Gaskell.

Despite the substantial evidence favoring a myogenic control of the heart beat, many eminent continental physiologists, including Dogiel, v. Cyon, Langendorff, and Kronecker, continued to support the neurogenic concept with apparently valid arguments. I can best sum up the status of the theories at the beginning of the present century by recalling that, as a young student assistant in physiology at Ann Arbor, I could do no better in 1904 to 1906 than list for students the evidence favoring the myogenic and neurogenic theories respectively, and then point out the arguments that had questioned their validity. Then came in quick succession the morphological discoveries of L. Aschoff and S. Tawara (1905-1906), A. Keith and M. W. Flack (1906, 1907), G. Fahr (1907), and many others, that proved more significant in establishing the myogenic theory than all the experimental work of the 19th century. During these years in Ann Arbor it was my privilege to witness Joseph Erlanger's demonstration of dissociated atrial and ventricular beats that followed clamping of the A-V bundle (1905), and Lydia DeWitt's construction of the 3-foot model of the His-Tawara Purkinje system, published in 1909.

Cardiodynamics

Experimental interest in cardiodynamics was inaugurated toward the middle of the nineteenth century through the enthusiasm of Étienne J. Marey (1830-1904) of Paris. While finishing his clinical training he recognized the need for applying known physiological principles to clinical problems and for extending observations through the unaided senses by means of instrumental aids. In 1857, he constructed an artificial circulation model for demonstrating hemodynamic principles, and in 1859 he made the significant observation that heart rate alters inversely to blood pressure. He found the pulse recorder designed by Karl v. Vierordt (1818-1884) wholly unsatisfactory for recording the form of the radial pulse and, in 1860, designed the first efficient radial sphygmograph. Some years later, Otto Frank (1865-1944) stated that every convenience introduced in subsequent models of wrist sphygmographs merely operated physically to reduce their figure of merit below that of Marey's original instrument.

Since registration of intracardiac pressure pulses required experience with operative procedures on animals, as well as ingenuity in designing pneumatic registering devices, Marey joined J. B. Auguste Chauveau (1827-1917) at the École Vétérinaire in Lyon. In 1863 they published

their tracings of phasic pressure changes in the cardiac cavities and large vessels of horses, thus inaugurating the procedure of cardiac catheterization. Their records, while not devoid of artifacts, approximated intracardiac pressure changes fully as accurately as many tracings from human subjects published in the present era.

Returning to Paris, Marey pursued experiments in a small private laboratory until he succeeded Marie J. P. Flourens (1794-1867) at the Collège de France. Here he engaged in basic cardiac studies. For example, in 1876 he delineated the relatively and absolutely refractory periods, analyzed the factors that determine the vigor of premature beats and called the pause that follows them " compensatory." His monographs, *Du mouvement dans les fonctions de la vie* (1868) and *De la circulation du sang* (1863, 1881), remain classical reference works today.

In the three decades following the publication of cardiac pressure pulses by Chauveau and Marey, intensive efforts were made to improve on pressure recorders and technical procedures, for it was recognized that correct pressure tracings furnish the key for an accurate interpretation of the performance of the cardiac pump. Unfortunately the great labors expended during the past century led to polemical discussions as to the merits of different recorders; the true forms of intracardiac pressure curves were not established until the present century. However, the zeal for recording intracardiac pressure pulses aroused an interest in the registration of pulsations in the lower cervical veins. The studies of venous pulses in animals by Marey's successor, Charles François-Franck (1849-1921), and by Léon Fredericq (1851-1935) in Liège, led James Mackenzie (1853-1925) a practicing physician in Burnley, England, to employ this technic in practice for diagnosing arrhythmias and tricuspid regurgitation (1894). Since its use for this purpose has been superseded by registration of electrocardiograms, it may be interesting to review the obstacles that needed to be overcome before a foundation for electrocardiography could be laid.

Electrophysiology

Going back to Müller's *Handbook,* we find that the existence of " animal electricity " had been demonstrated by the successive observations of Galvani (1791), Volta (1792), v. Humboldt (1797) and Nobili (1827). In 1834, Carlos Matteucci (1811-1868) of Turin, a pupil of Müller, showed that contraction of a frog nerve-muscle preparation causes a " secondary contraction " in another similar preparation, the nerve of which rested on the muscle of the first. For many years this so-called

" physiological rheoscope " constituted the most sensitive detector of weak, transitory currents generated by muscular contraction. Twenty-one years elapsed before A. v. Kölliker and H. Müller employed this preparation in demonstrating (1855) that each heart beat evokes two contractions. By recording the twitches, Donders showed in 1872 that they occur at the beginning and the end of systole, respectively. Unfortunately, this detector of bioelectric currents could give no information as to their origin, nature, or significance.

In 1841, Matteucci found that a small current flows from the normal surface of an isolated skeletal muscle to a cut section. Emil du Bois-Reymond (1818-1896) then an assistant of Müller, repeated the experiment with refined technic and, in 1849, discovered that the current between a normal and a cut surface—which he considered a " current of rest "—was diminished during tetanic stimulation. He called this the " negative variation current " but he realized that it was in fact an action current. Du Bois-Reymond soon became recognized as a genius in electrophysiological experimentation and, in 1858, was chosen as Müller's successor in Berlin. Here he planned and supervised the construction of a fine physiological institute opened in 1877, which under his direction developed into another great center for research and training of physiologists. Of his many contributions only a few of great importance in electrophysiological methodology will be mentioned, namely, invention of the inductorium with a sliding secondary coil, introduction of non-polarizable electrodes, and employment of compensating currents for measurement of bioelectric currents.

In 1867, Ludimar Hermann (1838-1914) while working in du Bois-Reymond's laboratory, found that uninjured resting muscles display no potential differences; hence he concluded that du Bois-Reymond's " current of rest " is actually a " current of injury." This was heresy in the Berlin Institute. When Hermann refused to repent, he was invited to leave the laboratory and indeed found other reputable institutes barred to him. Time of course proved the correctness of his views and, in 1884, he was chosen to fill the chair of physiology at Königsberg. This is only one of several historical episodes that should warn department heads to be tolerant of subordinates whose views do not accord with their own.

In 1871, Julius Bernstein (1839-1917), trained under Hermann, Helmholtz (1821-1894), as well as du Bois-Reymond, devised a differential rheotome by which momentary isochronous electrical impulses could be summated and recorded by the low-frequency galvanometers then available. By this new procedure he was able to demonstrate that a

negative electric potential travels with a definite velocity over an excited muscle. Bernstein later (1902) formulated the cross-polarized membrane theory to account for the origin and spread of electric potentials, which had a great influence in directing present day thinking.

A significant technical advance was made in 1872 when Gabriel Lippmann introduced the capillary electrometer, and another in 1876 when Marey arranged it to record photographically. However, while extremely sensitive to minute potential differences, the inertia of its mercury column distorted the forms of action potentials. It was only toward the end of the century that G. Burch in Oxford (1893) and Willem Einthoven in Leyden (1898) were able to correct records by use of rather laborious mathematical procedures.

These technical advances, developed primarily for studies on skeletal muscles, soon found an application in investigations of cardiac action potentials. In 1873, Engelmann showed 1) that the resting heart manifests no potential differences and 2) that, on stimulation, the nearer of two leading-off electrodes first becomes negative and then positive with respect to one placed more distantly on the heart. In short, he demonstrated that the ventricular action potential is diphasic. A few years later (1879-1881) Burdon Sanderson and Page showed in a slowly beating frog heart that the initial diphasic variation described by Engelmann is followed by a period of isopotential, and this is succeeded by a small deflection toward the end of systole. In other words, they demonstrated the triphasic ventricular action potential, the deflections of which were presently to be labeled R. S. and T by Einthoven (1895).

John S. Burdon Sanderson (1828-1905) was another of Sharpey's distinguished pupils. He succeeded Sharpey at University College in 1874 but transferred to Oxford in 1887 where he established another famous research center. In 1895 he was honored by election as Regius Professor of Medicine.

In 1889 one of his pupils, Augustus V. Waller (1856-1922) discovered that the action potentials of the human heart could be recorded by a capillary electrometer connected to a pair of electrodes placed on the chest and right arm. Waller constructed a diagram illustrating the approximate spread of potentials from the base and apex of the heart, which was the forerunner of Einthoven's more accurate delineation on which his triangle theory was based. Modern electrocardiography was thus born at Oxford, although Waller himself could not conceive of its usefulness in clinical studies. In 1903, Willem Einthoven (1860-1927) of Leyden published his first description of a string galvanometer adequate

to record cardiac action potentials in true form and introduced the three limb leads. Thus, at the beginning of the present century, the tiresome work of circumventing inadequate electrical recorders came to an end; an era began of trying to interpret what better ones revealed.

American Advances

While the chief advances in cardiac research emanated from Europe during the nineteenth century, a number of historical developments can be credited to our country. In 1873, Henry Newell Martin (1848-1896), another pupil of Foster, was called to Johns Hopkins University to found a laboratory of experimental biology. In 1883, he described a dog preparation in which the entire output of the left ventricle was shunted to the right heart. He used this to study the direct effects of the whole gamut of tolerable temperatures on heart rate. In 1884, his pupils, William H. Howell (1860-1945) and Henry H. Donaldson (1857-1938), using this preparation, showed that the cardiac output of the left ventricle is automatically adapted to the volume of blood received by the right heart. Thus the heart-lung preparation was developed in this country and used to demonstrate the innate capacity of the heart to adapt output to input of blood long before Ernst Starling (1866-1927) and his associates used it to study the cardiac mechanism by which this is accomplished. In 1890, Martin also prepared an isolated mammalian heart perfused from an elevated reservoir of defibrinated blood by way of a cannula in the aorta. Five years later, Oskar Langendorff (1853-1909) of Rostock, apparently unaware of Martin's accomplishment, described the same preparation. Owing to better publicity it continues to be known by his name. The isolated mammalian heart was subsequently employed by Howell to study the action of inorganic ions and to demonstrate the release of potassium on vagus stimulation.

In 1893, William T. Porter (1862-1949) joined Bowditch at the Harvard Medical School for the purpose of developing routine laboratory instruction for medical students. However, Porter also found time to pursue a vigorous research program; with various trainees he pioneered in the elucidation of the coronary circulation and ventricular fibrillation. Most of his conclusions have stood the test of time. He also ventured to analyze cardiodynamics by registering pressure pulses from the cardiac cavities, but these efforts proved no more revealing than those of European investigators.

In 1897, Reid Hunt (1870-1948) showed that there are species

differences in cardiac properties; the lobster heart has no refractory period and can be tetanized. Experiments performed in 1892 revealed that sympathetic and parasympathetic sets of nerves do not have algebraic summation effects on heart rate; further, that the sympathetic nerves cause specific augmentation of ventricular contractions and an abridgement of systole. In 1894, Hunt noted that choline compounds present in tissue extracts depress blood pressure and suggested that esterase might be involved. Later he showed that acetylcholine was 100,000 times as effective as choline, thus inaugurating the era of interest in neurohumoral excitation of ganglia and skeletal muscle.

In 1897, George N. Stewart (1860-1930) of Western Reserve University suggested a way in which the injection of dyes—hitherto used only for estimation of circulation time—could be adapted for calculation of cardiac output.

The time at our disposal has permitted us to do no more than to take a sort of Cook's tour through research institutes and laboratories of the nineteenth century; we have deliberately omitted the peripheral circulation and its control and merely glanced at a few cardiac researches that seemed significant to a guide. Such a tour would not be complete without the usual gratuitous information of the guide that there are of course many equally important contributors and contributions to cardiac physiology that should be surveyed on other occasions. These include investigations dealing with mechanisms of valve closure, causes of heart sounds, intracardiac pressures and cardiac output, processes of ventricular filling, cardiac work and efficiency, nature of ventricular fibrillation, human blood pressure measurement, and many others.

True to the traditions of historical surveys, I have also failed to acknowledge the contributions of many forgotten men of science which, though relatively unimportant *per se,* did, in the aggregate, fill many loopholes in the status that cardiac physiology had achieved at the beginning of the present century.

In closing, I can give no better summary of that status than to relate a personal experience. When, in 1903, I began to look for a research problem in the field of circulation, I could not cull from the literature any significant problem that either remained unsolved or seemed solvable by available tools; the cream seemed to have been skimmed off in the nineteenth century. Fortunately there were still a few questions, such as the regulation of cerebral and coronary blood flows, concerning which some division of opinion existed. With the enthusiasm of youth I felt it incumbent on me to settle these problems once and for all. This is the

spirit with which a novice falls in love with research but, once wedded to it, he discovers its more platonic aspects. He finds that research requires resourcefulness, perseverance, and sacrifice, as well as curiosity and initiative, that only limited success is interspersed amid many disappointments. He soon realizes that research, as the name implies, means searching again and again, to make quite certain that experiments which seemed crucial in one era remain valid when examined by new technologies. Thus, he gradually senses that new problems do not arise *de novo* but from reconsideration of investigations of past generations. Therefore the more thoroughly an investigator familiarizes himself with the circumstances that led to past interpretations, the more rewarding his own investigations are apt to be. Let me finish with a quotation from the German historian, Barthold G. Niebuhr (1776-1831):

> "He who calls departed ages back again into being,
> Enjoys a bliss like that of creating."

THE HISTORY OF METHODS FOR THE DIAGNOSIS OF HEART DISEASE *

VICTOR A. McKUSICK

The Physical examination. In the main the history of the physical examination of the cardiovascular system is the history of auscultation. This story, together with that of the development of phonocardiography and of our understanding of the physics of sound generation in the cardiovascular system, has been presented in detail elsewhere (1) (2) (3) (4) (5). A remarkable aspect of the story is the dearth of recorded interest in the subject before Laennec. Also impressive is the recent stimulus the field has received through the demands for precise diagnosis in connection with cardiac surgery. No better example can be cited to illustrate the effects of that stimulus than the development of knowledge of the mitral opening snap. A curious feature was the persistence of a preference for direct ausculation in France—the birthplace of the stethoscope—until well into this century. Humorous French cartoons from the early part of this century are based on anachronistic persistence of direct auscultation.

Ancillary diagnostic methods. The electrophysiologic background and early history of electrocardiography have been reviewed by Wiggers (6). Arrhythmias came first under study by this method, possibly because of the backlog of information provided by the polygraph of Mackenzie. The changes of myocardial damage, especially myocardial infarction, were subjected to intensive study in the 1920's and 1930's. In this area electrocardiography made its unique contribution. Vacuum-tube amplification and more recently the transistor transformed the electrocardiography from a colossus that filled a small room and required heavy mounting to an apparatus of the size and portability of an overnight bag. Vectorcardiography, implicit in the calculations by Einthoven (1912) of the manifest axis, or vector, of the QRS at close intervals of time, was made instrumentally practicable in the 1930's by the availability of the cathode ray oscilloscope. The method has taught us much about the electrical phenomena of the heart but is not likely to supplant the scalar electrocardiogram which contains the same information.

Roentgenologic methods of continuing use have been ordinary roent-

* This is a résumé of a presentation in the "Symposium on the Heart," American Association for the History of Medicine, thirty-second annual meeting, Cleveland, Ohio, May 22, 1959.

genograms, fluoroscopy, and angiocardiography. The last technique, first developed in the 1930's, has acquired increased value by the addition of modifications in the last ten years—selective angiocardiography, involving the localized injection of opacifying medium through an intracardiac catheter, and cine-angiocardiography. Fluoroscopic image intensification equipment has been a boon to cardiac catherization and to cine-angiocardiography. Some x-ray techniques have not survived for any wide use —orthodiagraphy, roentgen kymography, electrokymography.

Chauveau and Marey did *cardiac catheterizations* in animals, beginning in the 1850's. Without knowledge of this work, Forsmann in Berlin about 1929 and Cournand and Richards in New York about 1940 developed right heart catheterization. In the 80 years between Chauveau and Cournand several developments had made cardiac catheterization in man feasible, informative, and justifiable: X-ray was now available for guiding the catheter; blood gases and intravascular pressures could be readily and accurately estimated; Fick had worked out his principle on the basis of which cardiac output is estimated; and, most important of all, cardiovascular surgery was now with us, giving a *raison d'être* for the whole procedure. Left heart catheterization in man, by various approaches, is a development of the last decade.

Indicator dilution techniques for studying cardiac output and other hemodynamic parameters began with Stewart, who in the 1890's studied changes in the electrical conductivity of arterial blood when saline was injected in a remote vein. The principle involved is again that of Fick. In 1929 Hamilton adapted Evans' blue dye to the method. Within the last few years some type of indicator dilution technique has become a routine procedure in many laboratories for cardiovascular diagnosis. Variations in the indicator, the site of injection, and the site of sampling have been several.

The future. In the past, diagnostic methods have been first, anatomical, and secondly, in the somewhat more recent past, physiologic. It is likely that diagnostic methods of the future will be increasingly designed to detect susceptibility to heart diseases, especially coronary artery disease and hypertension—preventive diagnosis, if you will.

REFERENCES

1. McKusick, V. A., Sharpe, W. D., and Warner, A. O.: An exhibition on the history of cardiovascular sound including the evolution of the stethoscope. *Bull. Hist. Med.* 1957, *31*: 463-487.

2. McKusick, V. A.: Rouanet of Paris and New Orleans. Experiments on the valvular origin of the heart sounds 125 years ago. *Bull. Hist. Med.* 1958, *32*: 137-151.
3. McKusick, V. A.: *Cardiovascular Sound in Health and Disease.* Baltimore: Williams & Wilkins, 1958.
4. McKusick, V. A., and Wiskind, H. K.: Osborne Reynolds of Manchester. Contributions of an engineer to the understanding of cardiovascular sound. *Bull. Hist. Med.* 1959, *33*: 116-136.
5. McKusick, V. A., and Wiskind, H. K.: Félix Savart, physician, physicist, pioneer acoustician. *J. Hist. Med & Allied Sc.*, 1959, *14*: 411-423.
6. Wiggers, C. J.: In this issue of *Bull. Hist. Med.*

HISTORY OF THE TREATMENT OF HEART DISEASE IN THE NINETEENTH CENTURY *

HAROLD FEIL

Medical therapy and with it that of heart disease progressed little in the centuries preceding the 19th. Treatment was of symptoms, not of specific disease. Progress in medicine usually follows progress in basic science, and the 18th century laid a firm foundation for the development of therapy in medicine. Many well remembered men were responsible for fundamental advances in science—LaGrange, French mathematician and astronomer, who was responsible for the calculus of variations, the theory of differential equations, and for the metric system; Cavendish, English physicist and chemist, who contributed much on heat, the composition of air, hydrogen, and water; LaPlace, French astronomer and mathematician; Scheele, Swedish chemist who discovered chlorine and studied oxygen before Priestley, determined the nitrogen component of air, and discovered tartaric acid and glycerine. There also were Lavoisier, French chemist and physicist, who was one of the first to introduce effectively quantitative methods in the study of chemical reactions, and Galvani, Italian physicist and physician, Professor of anatomy at Bologna, and Volta, Italian physicist, famous for their work on electricity; Fahrenheit, German physicist, whose name is memorialized in the Fahrenheit scale, and Benjamin Franklin, American printer, scientist, and statesman. What a group of fundamental and applied scientists they were!

There was a steady increase in the clinical recognition of heart disease and in physiologic studies of the circulation. Rheumatic heart disease was described by Baillie in 1799, Wells in 1810, and Bouillaud in 1840. Little was said about either hypertensive or coronary heart disease, although Bright in 1836 described the large heart found in nephritis and ascribed the enlargement to overwork, as did Allbutt in 1895. A number of observers, Parry, Scarpa, Hodgson, Lobstein, Leyden, Marie, described coronary artery disease and myocardial infarcts, and rare cases of clinical coronary thrombosis were described by Hammer in 1876 and by Dock in 1896. It was necessary to wait until the next century, however, for

* Read at the "Symposium on the Heart," American Association for the History of Medicine, thirty-second annual meeting, Cleveland, Ohio, May 22, 1959.

hypertensive disease to evolve from cardiorenal, or Bright's disease, and for coronary thrombosis to be described clearly as a common clinical entity (Herrick, 1912).

In the latter part of the century electrical activity of the heart was studied in laboratory animals and in man. Other clinical physiologic techniques were developed during the latter half of the century; vital capacity recording (Hutchinson, 1846); sphygmography (Vierordt, 1855, and Marey, 1860); ballistocardiography (Gordon, 1877); blood flow studies (Pick, 1870, and Stewart, 1894) and sphygmomanometry (Von Bausch, 1881, and Riva-Rocci, 1891), but all of these methods became clinically available only in the next century. The concepts of cardiac failure gradually developed.

An anonymous verse written [1] at the start of the 19th century epitomizes the popular concept of cardiac therapy of the time.

> The King employs three doctors daily
> Willis, Heberden and Baillie.
> All exceeding clever men,
> Baillie, Willis, Heberden.
> Uncertain which most sure to kill is
> Baillie, Heberden, or Willis.

Let us look at the therapy of heart disease in the early part of the century: Blood letting was rampant and reached its zenith in popularity in the teaching of Corvisart, Broussais, and Bouillaud. Bleeding was produced by venesection, local bleeding, and by the use of leeches. No doubt some benefit was derived by patients with cor pulmonale and acute left ventricular failure. Dropsy was treated by saline and other hydragogue cathartics. Squill, in use since the days of ancient Egypt, was employed freely, and digitalis was always mentioned, but in insufficient dosage and in the wrong type of case. Laennec did not mention therapy in his writing, while Bertin and Bouillaud advised general and local bleeding with rigorous abstinence and rest.

James Hope, eminent British clinician and the first cardiologist, had perhaps the first clear concept of cardiac failure and the attendant symptoms. He advised in his treatise on *Diseases of the Heart,* 1831, the following treatments of heart disease: For acute pericarditis, venesection to the verge of syncope, or five to forty leeches to the precordium to be repeated if the pain did not subside, and catharsis. Mercury he stated was the sheet anchor of the practitioner, either as calomel or blue pill.

[1] Terence East: *The Story of Heart Disease.* London: William Dawson and Sons, 1958, p. 102.

Hyoscyamus and digitalis were given for nervousness. Acute endocarditis was treated similarly. Cardiac hypertrophy was treated by advising against violent exercise, intemperance, and excitement. Blood-letting was advocated, and four to eight ounces of blood were removed daily for two to six weeks. Angina pectoris patients were bled. Plethoric patients were put on a diet, restricted as to fluid intake, and purged. Dropsy was treated by diuretics such as tartrates, acetates, potassium nitrate, squill, juniper, digitalis, spirits of nitrous ether, cantharides, decoction of broom, and hydragogue cathartics. A pill of three grains of blue pill, one each of powdered squill and of digitalis, three or four times a day seldom failed. Palpitation was treated with tincture of digitalis, twenty or thirty minims two or three times daily. For dilatation (heart failure) Hope advised removal of causes such as hydrothorax, chronic bronchitis, emphysema, and asthma. The use of wind instruments and ventriloquism was prohibited. Occupations placing the patients in a strained position, as that of the tailor and shoemaker, were interdicted.

Valvular disease. In the acute phase antiphlogistic therapy and mercury were prescribed. In the chronic phase with failure, diuretics, purges, and diaphoretics were given. Puncturing of the skin of the thighs and trunk with a grooved needle was suggested. Expectorants were given for engorgement of the lung.

Aneurysm of the aorta. Hope modified the treatment of Albertina and of Valsalva by moderate bleeding (six to eight ounces every three to six weeks, with the first blood-letting of twelve to thirty ounces). Purgatives, diuretics, and digitalis to enfeeble and slow heart action were suggested, the latter to favor clot formation in the sack. The diet advised was dry, fluids were restricted, and animal foods were given sparingly. Application of leeches and cold poultices, and rest and quiet were advised.

Angina pectoris. Hope stated that it was important to ascertain whether heart disease was present. If so the patient was put at rest, and if flatus was present, he was given a drink of peppermint water with anise oil. Acidity was neutralized by soda or prepared chalk. If the stomach contained undigested food an emetic was given, provided the state of respiration permitted.

With extreme distress, six to ten ounces of blood were drawn by venesection or by leeching on the precordium. An antispasmodic or sedative drink was administered with tincture or extract of opium or acetate of morphine. When the pain was constant, counter-irritants, such as blisters, setons, or issues in the precordial region were found useful. A belladonna plaster was also found valuable. On the other hand, in

cases dependent on hysteria, dyspepsia, anemia etc., the primary disease demanded first attention, while the neuralgic pain was combatted by counter-irritants and occasional sedatives. The pathologic physiology in coronary disease was not clearly and widely appreciated.

The remedy employed by Laennec successfully in angina pectoris and in neuralgia of the heart of a slight kind and without radiating pain, was a magnet, applying two steel plates, strongly magnetized, one on the precordial region and the other on the opposite part of the back, in such a manner that the poles were exactly opposite, and so the magnetic current traversed the part affected. Hope reported: "This remedy, Laennec adds, is fallible no less than all those by which we ordinarily combat nervous affections, but it has succeeded in his hands oftener and to a greater extent than any other." When the treatment did not alleviate the angina, favorable results were obtained by applying a small blister under the anterior plate. Hope commented: "It should be remarked that they who witnessed the application of the magnet by Laennec, did not, in general, form so favourable an opinion of its utility as that author himself." [2]

John Wesley, of religious fame, wrote a small book, entitled *Primitive Physic,* which went through many editions. It was a "Do it yourself" book of medical advice. In the edition published in 1792, he advised the use of laudanum for angina. His comment was "This helps." [3]

Angina pectoris was just becoming recognized as Peter Latham of St. Bartholomew's Hospital, in his lectures on the heart,[4] wrote an excellent account of the case of Thomas Arnold of Rugby in which he described the current therapy of severe angina. This report was no doubt that of a case of severe coronary insufficiency or of acute coronary thrombosis. The treatment consisted essentially of brandy, mustard plasters to the chest, and opium.

The symptomatic treatment of angina pectoris by the inhalation of amyl nitrite was introduced by Lauder Brunton in 1867. He had noted the rise in tension of the pulse during an attack and speculated that vasodilation might relieve the pain by reduction of the arterial pressure. Thus a remedy was discovered by incorrect deduction. William Murrell in 1879 introduced nitroglycerine. He had heard of its properties from

[2] J. Hope: *A Treatise on the Diseases of the Heart and Great Vessels.* London: John Churchill, 1839, pp. 501-2.

[3] J. Wesley: *Primitive Physic.* London: G. Paramore, 1792, p. 86.

[4] P. M. Latham: *Diseases of the Heart.* Philadelphia: Ed. Barrington and Geo. D. Haswell, 1847, p. 342.

a Mr. Field of Brighton some years before. Brunton, in 1876, discovered that nitroglycerine had an action on the circulation similar to amyl nitrite, but because of the severe headache he suffered while experimenting with it, hesitated to give it to patients. Nitroerythrol was described in 1883 as a more prolonged vasodilator.

Before the latter half of the 18 century, patients with heart disease were usually required to rest and keep quiet. But in his treatise of 1854 William Stokes [5] pointed out that the symptoms of debility of the heart were often relieved by a regulated course of gymnastics, or by walking, even in mountainous countries. Gradually the Swedish movements and the mechanical contrivances of Zander were applied to be followed by the slow " resistance gymnastics," breathing exercises and high protein diet of Oertel (1884), and the combined exercise, rest, and carbonated baths of Nauheim (1880).[6] The action of the Nauheim baths was explained by tissue changes produced by greater power of absorbing oxygen by the cells. Schott [7] pleaded that the treatment accounted for the need of rest and sleep following the administration of each carbonated bath. He held that this increased tissue change demanded great care on the part of the physician, lest an irritable and excitable state of the nervous system be produced by excess of bathing. Schott held that there is a reflex stimulation of the heart producing more complete and thorough contraction, as the result of which the heart hypertrophies. Schott was of the opinion that there may also be some direct physiological stimulation of the arterioles and capillaries by the passage of CO_2 through the skin, so as to come in contact with the deeper tissues. The effect of the Nauheim treatment was thought to be due to the fresh bracing air of the district, enjoyment of the large amount of sunshine, provided with sufficient shade to protect the patient from the direct rays of the sun. The patient's life at Nauheim was one of peaceful routine. He arose between seven and eight in the morning and went to the Wells, where, if encouraged to use the springs, he sipped the water, as is usual in such bathing-places, with the accompaniment of an excellent orchestra. He then returned quietly to his hotel for breakfast, or enjoyed it in some shady nook outside, and after glancing over the morning paper, had his bath. After this he rested, and almost certainly

[5] William Stokes: *Diseases of the Heart and Aorta.* Philadelphia: Lindsay and Blakiston, 1854, p. 357.

[6] G. A. Gibson: *Diseases of the Heart and Aorta.* Edinburgh and London: Young J. Pentland, 1898, p. 272.

[7] A. Schott, and T. Schott: Die Neuheimer Sprudel—und Sprudelstrombäder. *Berl. klin. Wchnschr.*, 1884, *21*: 294-8, 307-11.

fell into a calm sleep, from which he probably did not awake until time for luncheon. After luncheon he again rested until the heat of the day was past, probably sleeping part of the time, and then had the resistance movements, or some gentle exercise, until time for dinner, after which he was glad to seek repose. In this way, life at Nauheim was restful in the highest degree. Thus does George Gibson [8] describe life at the European spas in the latter part of the 19th century.

Dropsy: Squill was a popular diuretic for dropsy throughout the 19th century. Francis Home (1719-1813) of Edinburgh was the first to demonstrate the cardiac inhibitory action of squill, and throughout the 19th century it was used as a diuretic long after Withering's classic description of foxglove. Other drugs for the relief of dropsy were popular in the early part of the century. Mercury, in the form of blue pill and calomel, was widely employed. A favorite pill was composed of mercury, squill, and digitalis, equal parts. Hydragogue cathartics were universally used, such as jalap and salines. As a last resort paracentesis and local drainage of the oedematous extremities were practiced. Pericardial paracentesis was introduced by Vernay in 1856. A light diet with fluid in small quantities was advised, though there were no rules about salt or fat except in the Karrell Diet (1866). The latter consisted of 200 cc. of milk four times a day. This diet had a low content of salt (1 gm), fluids, and calories. Opiates were used in emergency.

Digitalis was a much neglected therapeutic agent in the 19th century in spite of the precise and accurate directions given by William Withering in 1785. The Dublin School and many English physicians had no clear idea of its value in heart failure. Only in the latter part of the century did digitalis come into its own in atrial fibrillation and in heart failure, largely through the efforts of Sir James Mackenzie. Meanwhile Vulpian, a French physician, first used the experimental method to elucidate its action in 1855. In the latter part of the century Brunton and Cushny also studied its action in the physiological laboratory. Convallaria (lily of the valley) gained much popularity in central Europe because of its similarity of action. Nativelle introduced digitoxin in 1845. " Strychnine, camphor and caffeine have of late years come to receive such an amount of commendation, that the belief in their efficacy amounts almost to a superstition, yet given in medicinal doses, they are absolutely without detectible effect upon the heart or blood vessels, experimentally or on the human subject," wrote James Mackenzie.[9]

[8] G. A. Gibson: *loc. cit.*, p. 274.

[9] Sir James Mackenzie: *Diseases of the Heart.* London: Henry Frowde and Hodder and Stoughton, 1913, p. 354.

Homeopathy and Therapeutic Nihilism: In the preceding century the number of substances theoretically available for the treatment of disease had increased by the addition of so many useless drugs, that the study of materia medica and the practice of medicine had become hopelessly complicated. Realizing this and appreciating the abuses of other forms of treatment, Hahnemann (1755-1843) of Meissen developed the theory that disease depended upon a perversion of the purely spiritual vital powers and was entirely immaterial in its nature. He advocated minute dosage of drugs, hygienic living, and diet.

Homeopathy spread throughout Europe and America with the establishment of schools and hospitals. But the regular school of medicine held the methods up to ridicule, and Oliver Wendell Holmes' famous lecture, published in 1842, became a classic. While the principles underlying homeopathy were seriously questioned, it was realized that Hahnemann's work had exposed many earlier therapeutic abuses. This led to the conclusion that when drugs are continued for long periods, they may in themselves be responsible for the continuation of symptoms. If good came from minute doses, and this was agreed by many of the regular school, then no medication might be even better. This attitude led to the period of therapeutic nihilism, and in Berlin the most famous physician was he who could say at autopsy " everything has been found exactly as I expected."

Rheumatic Fever: Rheumatic heart disease as a clinical entity first appeared in medical literature of the last quarter of the eighteenth century, when it was found that disease of the heart occurred frequently in people who had had rheumatic fever. Valvular disease had been described by Raymond Vieussens and Giovanni Morgagni, but the relation to rheumatic fever had not been recognized. Bouillaud emphasized this relationship.

The therapy of rheumatic fever was based on the theory that the disease was inflammation without suppuration. Bleeding was the chief therapy. Hope [10] (1842) wrote in his treatise: " After one full bleeding, or even two, in robust subjects, but without any bleeding in the feeble and delicate, I give, every night calomel, and opium, according to the age and the severity of symptoms." This was followed every morning by infusion of senna or magnesium sulphate. In addition he gave wine of colchicum and powdered ipecac.

Salicylates were introduced in the treatment of acute rheumatic fever in

[10] J. Hope: *loc. cit.*, p. 179.

1876 by J. J. Maclagan.[11] His discovery of the specific action of salicylates came about in a curious fashion. He was impressed by the observation that certain diseases were effectively treated by drugs derived from plants or trees growing in places where the diseases were prevalent, as the cinchona tree in malaria districts, and ipecacuanha in areas where dysentery is common. Therefore a remedy for rheumatism should be looked for among those plants and trees whose favorite habitat presented conditions analogous to those under which the rheumatism miasm seemed most to prevail, a low-lying, cold, damp locality.

On reflection it seemed to me that the plants whose haunts best corresponded to this description, were those belonging to the various forms of willow. Among these therefore, I determined to search for a remedy for rheumatism.

The bark of many species of willow contains a bitter principle called Salicin. This principle was exactly what I wanted. To it, therefore I determined to have recourse.

I began to use salicin in the treatment of rheumatism in November, 1874. A short experience sufficed to show that my expectations were likely to be more than realized. . . . But no one ever claimed for these remedies the power to rob acute rheumatism of all its dangers.

While these observations on salicin were being made, Kolbe, in Germany, having discovered a method of manufacturing salicylic acid (originally prepared from salicin) from carbolic acid, was bent on finding some use for it. First, tried by surgeons as an antiseptic, it was freely experimented with by physicians in all sorts of diseases, but chiefly in those attended by fever. Its febrifugal properties were soon recognized. But it was soon seen by C. E. Buss, who recalled the use to which willow had been put, that the disease in which it did most good was acute rheumatism.

Research was directed to salicylic acid, in an effort to discover a modification that would be better tolerated therapeutically. Finally, in 1899, Dressar introduced aspirin (acetylsalicylic acid). The name was coined from " A " (acetyl, from the method of acetylization) plus " Spir " (from spiraeic acid, obsolete name for salicylic acid). Thus we have the origin of the most widely used antirheumatic drug today.

In 1892 appeared the first edition of *The Principles and Practice of Medicine* by William Osler. Cardiac compensation and broken compensation were well defined, but the treatment of heart and blood vessel diseases had changed little from the time of Hope. He still advised blood

[11] T. J. Maclagan: ***Rheumatism, Its Nature, Its Pathology and Its Successful Treatment.*** London, 1886, p. 156.

letting, leeches, and blisters in acute pericarditis. With large effusions, he advocated aspiration. In acute endocarditis, aconite and a precordial icebag were advised. Salicylates were given. For malignant endocarditis, no definitive therapy was offered. In chronic valvular disease with heart failure, Osler's advice was as follows: venesection, saline catharsis and digitalis. The latter he emphasized by the statement: "There are no substitutes for digitalis." Southey tubes, introduced in 1877, and paracentesis of the chest were advised when other treatment failed. Guy's pills were still suggested. Osler felt that the beneficial effects of digitalis were best seen in cases of mitral disease with small irregular pulses. In cases of cardiac dropsy, from whatever cause, 15 m. of the tincture of digitalis or ½oz. of the infusion were given every three hours for two days, and then the dose was reduced. For hypertrophy and dilatation of the heart venesection was still suggested. His advice in angina pectoris was much the same as that of previous authors. Myocardial infarction had not yet been diagnosed clinically. Congenital heart disease was treated symptomatically. The treatment of arteriosclerosis was vague. Under the discussion of the therapy of aneurysm the Tufnell diet had replaced that of Morgagni and Valsalva. When the sac presented externally, an ice cap or a belladonna plaster was suggested for relief of pain. Drugs used in the treatment of heart failure during the 19th century were aconite (as a sedative), camphor, strychnine, veratrum viride, and caffeine. During the 19th century treatment of cardiovascular diseases developed slowly and was still in a primitive state in 1900. The remedies described by Sénac in 1749 were still largely operative.

The Rockefeller Institute for Medical Research had its origin in Dr. Osler's perfectly frank disclosure of the very narrow limitations of ascertained truth in therapy as it existed in 1897. One of Mr. Rockefeller's advisors wrote:

> But there were other things besides its style that attracted and intensified my interest. . . . To the layman student, like me, demanding cures, and specifics, he had no word of comfort whatever. In fact, I saw clearly from the work of this thoroughly enlightened, able and honest man, perhaps the foremost practitioner in the world, that medicine had—with the few exceptions above mentioned—no cures, and that about all that medicine up to 1897 could do was to suggest some measure of relief, how to nurse the sick, and to alleviate in some degree the suffering. Beyond this, medicine as a cure had not progressed.[12]

Thus we leave the 19th century with treatment of heart disease

[12] H. Cushing: *The Life of Sir William Osler*. Oxford: Clarendon Press, 1925, vol. I, p. 454.

largely symptomatic and not definitive. Clinical observations of this century were brilliant, and the case for heart disease was well stated. Fundamental research was under way. The various disciplines of medicine prepared the way for the brilliant prophylactic and therapeutic discoveries of the present century. We may end with the words of Seneca, quoted by Vieussens in 1715:[13]

"Those who were before us did much, but they did not complete; much of the work yet still remains, and much will remain, and the opportunity of adding something will not be denied to anyone born a thousand ages later."

[13] Raymond de Vieussens: *Traité nouveau de la structure et des causes du mouvement naturel du coeur.* Toulouse: Jean Guillemette, 1715, introduction. Also quoted by Terence East, *loc. cit.*, p. 145.

THE HISTORICAL DEVELOPMENT OF THE SURGICAL TREATMENT OF HEART DISEASE *

GEORGE H. A. CLOWES, JR.**

This symposium is well planned, indeed, from the viewpoint of the history of the development of cardiac surgery. Dependent as it has been for development upon physiology and biochemistry, exact diagnosis, and cooperation with the physicians in the care of the patient suffering from heart disease, it is very appropriate that a review of surgery of the heart should appear, as it does, following the other excellent papers.

Little more than 60 years ago, Wilhelm Justus was stabbed in the chest and left for dead in Frankfurt on Main. He was taken to the hospital Klinik of Professor Dr. L. Rehn (1). The wound oozed slowly, but as the area of heart dullness increased, the pulse became weaker. Thirty-six hours later upon his return to the city, Prof. Rehn undertook to operate upon this young man. He was aware of the fatalistic attitude toward wounds of the heart, " the center of the being," which had persisted since Greek and Roman times. The great and respected Billroth (2) in 1883 wrote, " A surgeon who would attempt such an operation (cardiac suture) should lose the respect of his colleagues." He was aware, also, of Morgagni's (3) description of the disastrous effects of hemopericardium and cardiac compression which resulted in death. Rose, in his monograph of 1884, had coined the term " heart tamponade " (4). Romero (5), in 1819, had successfully opened the pericardium for effusion in three patients with recovery in two. Larrey (6), the famous surgeon of Napoleonic times, had prolonged the life of a man with a cardiac wound resulting from a suicidal stab. The man being fully conscious, a thoracotomy had been peformed and a trochar driven into the pericardium.

In 1868, Fischer (7) published the postmortem analysis of 452 cases of wounds of the heart observed both in men and animals. In this he estimated a recovery rate of about 10%. Block (8), in 1882, and subsequently del Vecchio (9), in 1895, had opened the thorax in living

* Read at the " Symposium on the Heart," American Association for the History of Medicine, thirty-second annual meeting, Cleveland, Ohio, May 22, 1959.

** From: Western Reserve University School of Medicine, Department of Surgery at Cleveland Metropolitan General Hospital, Cleveland 9, Ohio.

rabbits and dogs to inflict cardiac wounds which were subsequently sutured with survival.

Yet, Rehn was not aware of any surgeon's exposing the human heart to close a wound by suturing before the blood should all be lost. Actually, Cappelen in Christiania (September 1895) and Farina in Italy (March 1896) had successfully sutured human hearts. In both cases the patients had died of complications in the postoperative period.

Through an incision in the fourth interspace Rehn opened the left pleural space to expose the pericardium. As the lung collapsed, a hole was clearly visible through which blood had been flowng into the thoracic cavity. When the pericardium was laid open, the wound, one-half inch in length, was found in the middle of the right ventricle. A finger pressed upon it stopped the bleeding. As a suture was thrust into it and pulled up, the heart faltered momentarily and continued its beat. A second suture was placed and the bleeding was controlled. The patient's recovery was complicated by a pericardial effusion drained on the twelth day and prolonged respiratory difficulty and empyema. The collapsed lung was slow to reexpand.

By his daring and successful surgical attack upon an injury of a live heart Rehn refuted those who stated that any wound, and in fact, the mere touching of the heart would disorganize its rhythmic contraction. The researches of His (10) supported his position and proved that injury in areas removed from the pacemakers and conduction mechanism only transiently affected the beat, if at all. The inner sanctum had been entered, and the stage was set for the development of cardiac surgery.

It is the purpose of this paper to trace the development of the principles of cardiac surgery to the present day. Space will not permit a recitation of the vast number of techniques developed to deal with the varied problems of cardiac disease and the great number of physiological, anatomical, and pathological experiments upon which they are based. Rather, we will deal first with techniques and then with four great branches of heart surgery to show how this progress took place. More or less in order of appearance they are: 1) surgery of the pericardium, 2) surgery of the valves, 3) surgery for the correction of congenital anomalies, and 4) surgery for coronary insufficiency.

In 1926, when Dr. Claude Beck (11) reveiewed the history of cardiac surgery, he confined his remarks to the first two. Although much experimental work had been done and some slight clinical success attained, the time was ripe, and this field of endeavour flourished after World War II. The techniques of intrathoracic surgery and the physiology of respiration

and circulation had developed to the point at which the surgeon might hope for success in dealing with the heart. Anesthesia and aeration of the lung during thoracotomy were only slowly worked out. Techniques for the handling and anastomosis of blood vessels, started by the work of Carrel (12), were brought to a pitch of perfection which subsequently permitted the brilliant work of Gross (13), Crafoord (14), Blalock (15), Potts (16), and many others. An understanding of the role of infection played its part. The use of hypothermia first permitted brief cessation of blood flow. The artificial maintenance of circulation by pumps and subsequently the artificial aeration of blood was dependent upon the discovery of heparin by McLean, working with Howell and Holt (17).

The Development of Thoracic Surgery

External operation for collapse of the lung by Schede (18) and Estlander (19) were developed for the treatment of tuberculosis. In 1893 and 1894, Fowler (20) and Delorme (21) had independently described operations for decortication of the lung. Developments were, however, limited by the danger accompanying collapse of the lung when the chest was opened. Quénu (22) created a helmet whch fitted snugly over the head in order to administer positive pressure for respiration. Tuffier (23), in 1896, introduced a tube into the larynx and trachea. Through this air was blown into the lungs by a bellows. Subsequently, in 1909, this method was perfected by Meltzer and Auer (24). Sauerbruch (25), in 1902, worked out a negative pressure chamber in which the operator and patient were placed with only the patient's head outside, permitting a differential of pressure adequate to maintain expansion of the lungs. This was cumbersome and expensive. With the perfection of endotracheal insufflation by Meltzer and Auer this method superseded all others and promptly opened up great possibilities for thoracic surgery. The necessity for oxygenation of blood was obvious, and failure to do so produced cyanosis which was readily apparent. Beecher and Murphy (26), as late as 1942, drew attention to the lack of carbon dioxide removal with the consequent development of respiratory acidosis frequently present during thoracotomy. Many others followed this lead in studying the general effects of hypoxia and hypercapnia (27) (28) (29). Increased understanding of the normal response of man to trauma of the extent inflicted by thoracotomy was gained by many investigators prompted by the research of Moore and his associates (30). This led to more rational use of fluids and electrolytes in the care of these patients.

Development of Endocardiac Surgery

Following the brilliant results of Harken (31) working in a base hospital during World War II in the removal of foreign bodies from the chambers of the heart, a variety of blind endocardiac procedures were developed, particularly in relation to valve surgery. This will be dealt with presently in greater detail. It has been apparent for many years that endocardiac procedures could best be performed in an open heart temporarily separated from the circulation. Yet, Von Haecker (32), Cushing and Branch (33), and the Heymans (34) had shown that permanent cerebral damage was inflicted upon animals if the circulation was arrested for more than three minutes. This problem was attacked from two standpoints. Cooling of the whole body, or hypothermia, offered a means by which the metabolism of vital organs might be lowered to the point at which the circulation might be stopped by occluding the venae cavae as they entered the heart for a period long enough to permit certain operations on the auricular septum or certain of the valves. The pioneer work of Bigelow and his associates in Toronto (35) (36), Lewis et al. (37) in Minneapolis, and of Swan in Denver (38) (39) opened up this field. Their many basic studies indicated that in man a safe lower limit of 28°C. should not be passed for fear of serious cardiac arrhythmias and circulatory failure. At this temperature the period of time permitted the surgeon was not much over ten minutes. Many successful operations were worked out to permit employment of this method.

The other approach to the problem is that of temporarily supporting the circulation by artificial perfusion of the entire body during the period in which the heart is rendered non-functional. For many years physiologists had been interested in this technique to aid them in conducting experiments on the heart and circulatory organs. Among the first successes in this work were the experiments of Dale and Schuster (40) in 1921. A considerable variety of pumps and oxygenators have been designed. Among the surgeons interested in the problem, Dr. John Gibbon, Jr. (41) of Philadelphia started his investigations nearly thirty years ago. He demonstrated the principles upon which such a device should operate for the elimination of carbon dioxide and the addition of oxygen to venous blood before pumping it back into the arterial tree. Ultimately, with the aid of many collaborators, he designed an apparatus consisting of screens down which a film of blood flowed for gas exchange. Using this, Gibbon in 1953 performed the first successful open heart operation conducted with an "artificial lung." Sewell and Glenn (42) developed pumps which they experimentally substituted for the right

heart. Wesolowski and his associates (43) and many others (44) (45) (46) used pumps simultaneously for both sides. Dodrill (47) in Detroit successfully effected temporary substitution of a pump during a clinical operation upon the pulmonary valve. Lillehei (48), in 1954, performed "controlled cross circulation" from a cross matched human donor in whom the blood was oxygenated while the patient was perfused with blood pumped from the donor's arteries and returned to the donor's veins. The technique of cross-transfusion with its attendant dangers was only a stopgap until artificial oxygenation could be accomplished.

Although pumping of heparinized blood appeared relatively easy, the oxygenation of blood artificially was more of a problem because of the dangers of embolization from gas bubbles or fibrin emboli, the destruction of blood elements, and the difficulties in maintaining an adequate acid-base balance. Among the other early effective oxygenators which were developed were the rotating disc type of Bjork (49), later modified by Kay and Cross (50), the filming oxygenators of Dennis and Karlson (51), the bubble oxygenator of Clark, Gollan, and Gupta (52) which depended on the breaking of the bubbles by a siloxine antifoam, and the membrane oxygenators described by Kolff (53) and Clowes and Neville (54). The large bubble oxygenator was brought to a point where it was believed safe for use by DeWall in 1956 (55). With this many operations have been performed at the University of Minnesota (56). At Baylor University, Cooley (57) has also applied this method extensively and with success. Kirklin at the Mayo Clinic adopted the screen oxygenator and, after overcoming initial difficulties, has operated upon a long series of patients. The membrane oxygenator, being a closed system and free of the dangers of gaseous emboli, has been successfully applied to intracardiac surgery by Clowes and Neville (58). Recently, Peirce of Knoxville (59) and Brown, Smith, Young, and Sealy (60) of Duke University have suggested and applied the combination of hypothermia and perfusion, making safe the use of low flow rates inadequate at normal body temperature. There has been much activity in this field both in the study of methods and of the physiologic response to artificial perfusion, and at the present the technique is being applied in many centers with relatively low mortality.

Decortication of the Heart

Cases of adhesive pericarditis interfering with heart action were divided by Churchill (61) into those which bind the heart to the chest wall and those which constrict the heart preventing its filling. Weill (62), in 1895, recognized that the rational treatment of liberating the heart lay within

the purview of surgery. Three years later Delorme (63), encouraged by the results of pulmonary decortication, realized that the same principles could be applied to the encased heart. His detailed studies on cadavers disclosed that the adhesions between the heart and pericardium could be separated by dissection. His findings were disregarded in favor of the less effective operation of cardiolysis designed by Brauer (64), a professor of medicine in Marburg, in which the rib cage was simply resected over the pericardium.

As early as 1913, Sauerbruch (65) had freed a portion of the ventricles in a patient confined to bed with dyspnea. Eleven years later this patient was reported well and at work. Rehn (66), who is commonly accredited with pointing the way to this operation, clearly described the technique and pathologic problems. In 1928, Churchill in Boston performed the first successful pericardial resection in this country.

With studies on hemodynamics giving a greater understanding of the problems, Burwell (67) recently wrote, " Patients with constrictive pericarditis, if not treated by surgical therapy, show little tendency to improvement and tend to deteriorate gradually over the years." Holman, in 1950, drew attention to the need for a more radical approach to free not only the ventricles but the auricles and venae cavae. Improvements in technique and greater boldness suggested by Beck (68), Johnson and Kirby (69), and others have resulted in an increasingly large proportion of patients with satisfactory postoperative histories. A recent report from the Mayo Clinic (70) quotes 86% good results, with an overall operative and postoperative mortality of 12% on follow-up for five years.

Although Churchill (71), Beck (68), and others observed that it was very dangerous to operate upon the pericardium in the acute stage of tuberculous pericarditis, this has been modified by the advent of successful chemotherapeutic treatment of tuberculosis by streptomycin and other drugs. Recently, Holman (72) recommended early pericardiectomy for patients suffering from this disease to prevent the sequelae of prolonged scar formation about the heart. Other diseases and infections of the pericardium are being more frequently treated by pericardial drainage and pericardiectomy for the relief of tamponade, infection, and constriction.

Valvular Surgery

Emboldened by the success in handling of traumatic wounds of the heart, Sir Lauder Brunton (73), in 1902, wrote ". . . before very long similar good results may be obtained in cases of mitral stenosis." His temerity provoked a storm of criticism but also support.

The technical problems associated with this proposal appeared great at the time. Yet, surgical investigators undertook its study, basing their work on that of physiologists. Becker (74), in 1872, in an exhaustive treatise on pulsation of the retinal vessels associated with aortic insufficiency, described a method of inserting tiny knives down the left carotid to destroy one or more aortic leaflets. Klebs (75) conducted similar experiments, using what he referred to as a "valvulotom." McCollum (76), in 1906, demonstrated important pressure changes and used the method to teach medical students about valvular insufficiency. Von Haecker (32) in Germany, and Cushing and Branch (33) in this country, in 1907, reported experiments with recovery in which a transthoracic approach had been made to the study of mitral regurgitation by inflicting valvular incisions with a high degree of certainty in location and extent. The many contributions of Carrel and Tuffier (77), published in 1914, emphasized the necessity for perfect precision and asepsis within the thorax, proving this field as safe as others for surgery. Allen and Graham (78), in 1922, devised a cardioscope for use in visualizing the mitral valve for accurate correction of stenosis. This was subsequently used for operation unsuccessfully upon one patient. They also studied pressure changes in the left auricle occasioned by stenosis produced with a ligature about the mitral ring.

After many experiments in which a variety of instruments were tried for sectioning the leaflets of the mitral valve in animals with observations made on the results, Dr. Elliot Cutler (79) undertook to operate upon his first patient with mitral stenosis. The operation was performed on May 20, 1923. Through a midline sternal incision the heart was exposed. The right ventricle was large and overlapped the left ventricular apex. This necessitated dislocation of the heart to permit insertion of a "knife valvulotome" through the wall of the left ventricle. Two cuts were made, the first into the posterior leaflet, the second into the aortic leaflet. He had postulated that moderate degrees of regurgitation were accepable if the stenosis were relieved. He was aware that acute regurgitation in dogs resulted in fatal pulmonary edema. The heart almost stopped but was revived with hot saline and adrenaline. The patient had a stormy postoperative course, but subsequently recovered to survive for another four and one-half years. During this period she was temporarily somewhat improved but went on to cardiac failure and death.

Powers (80) and Cutler and their associates created experimental mitral stenosis in animals analagous to that found in man by coagulation of the valve. Subsequent correction gave a high mortality which Powers

concluded was due to regurgitation. When Cutler and Beck (81) reviewed the whole reported operative experience in valve surgery (12 patients) in 1929, they had operated upon seven cases with only one survivor, the first. They had approached the valve with punches and knives both through the ventricle and through the atrium. Pribram (82) also tried a valvulotome, with success. In 1925, Souttar (83) in London performed the first mitral valve operation in which a finger was placed within the auricle to palpate the valve. He was able to dilate the stenosis by finger pressure in a fashion similar to that now in use. Yet, another 25 years was to pass before it came to be accepted. Although the physical signs changed but little after the operation, Souttar's patient recovered satisfactorily and was improved in her ability to take exercise.

Sweet and Bland (84) proposed and carried out an operation for decompressing the left auricle in 1947 by anastomosing the azygos vein to a pulmonary vein. Some of their patients were relieved of dyspnea. D'Allaine (85) also suggested the creation of an atrial septal defect.

On June 16, 1948, Harken (86) in Boston operated upon a man with mitral stenosis using a valulotome introduced through the left atrium, so that the stenotic coneshaped valve would guide the instrument into the stenotic orifice. His previous experiments in dogs had suggested that if possible the commissures should be cut. Failing this, division of the minor leaflet resulted in a less serious regurgitation. This was done, and the patient survived with some improvement. From this experience and one previous operative mortality, certain principles were deduced: dislocation of the heart must be avoided; regurgitation must be minimized and leaflet function restored by " selective valvuloplasty " ; and tachycardia must be prevented.

On May 17, 1948, in Philadelphia Charles Bailey (87) operated upon his fifth patient with mitral stenosis; this patient survived, the previous four having died. He inserted his finger into the auricle through an incision surrounded by a purse string suture. Beside the finger he inserted a hooked knife which was engaged in the lateral commissure which was divided without producing regurgitation, leaving a widely patent valve. The pressure was lowered in the auricle, and the patient recovered uneventfully, being greatly improved.

Brock (88) in London, working independently of the American investigators, on September 16, 1948, successfuly split the fused commissures of a mitral stenosis by direct finger pressure. Operative procedures could be done on the mitral valve guided only by the surgeon's palpating finger in the left auricle.

In reporting the results of Harken's first 1000 patients operated upon for mitral stenosis, Ellis, Abelman, and Harken (89) compared the surgical results with those obtained by medical management, using data obtained by Grant (90), Wilson and Greenwood (91), and by Olesen (92) in Sweden. The last named author's series observed were the most significant, being a comparable population of patients not subjected to surgery. Of those in Group III, 87% were alive after seven years, and this included a 3% operative mortality. Whereas, of the medically treated group, 57% were alive after a like period. In the Group IV patients (suffering chronic heart failure), 54% were surviving after seven years. Nearly all of the patients who had not been operated upon were dead. Much has been learned concerning the effects of myocarditis and of concurrent disease of other valves on the results of mitral surgery by the researches in hemodynamics conducted in laboratories throughout the world using the techniques of Cournand (93) and his associates.

Mitral insufficiency has been attacked by many closed methods with generally indifferent results. If moderate, the placement of baffles under the minor leaflet to allow the major leaflet to reach it has been advocated by Harken (94). Kay (95) developed a technique for placing a sling across the ring to distort it to an oval shape, again allowing the leaflets to meet. Murray (96) in Toronto, in 1950, tried placing a vein covered pedical graft through the mitral valve to close the regurgitant defects created by a valvulotome in attempts to cure mitral stenosis. Glenn (97) at New Haven, in 1957, successfully applied this principle to the treatment of organic mitral regurgitation. Bailey and his associates (98) developed a technique for internally stitching a portion of the leaflet margins together. Although some excellent results were obtained, there was also a mortality of nearly 30% due to valvular tears and increased regurgitation or stenosis. D'Avila and Glover (99), by placing a circumferential ligature around the ring, were able to close it down so that the leaflets could meet. The early results by the latter technique were excellent. Yet, in the experience of surgeons who tried it, the ligature tended to cut out in time with a recurrence of regurgitation.

With the advent of open heart surgery under leisurely conditions, made possible by the development of artificial perfusion by pumps and oxygenators, surgeons naturally turned to the insufficient value. Reports appeared in 1957 from Lillehei (100), Merendino (101), Kay (102), and Effler (102A) on successful procedures accomplished by suturing the valve ring at the commissures to allow approximation of the leaflets. Prosthetic substances were even placed to reconstitute the minor leaflet.

The eventual outcome of these operations remains to be seen. The immediate results are quite satisfactory in about 60% of the patients, and the operative mortality is not prohibitive (about 11%).

Aortic Valve

Perhaps the earliest attempt to devise a surgical treatment for stenosis of the aortic valve appears in the work of Jeger (103). After extensive study of methods of reinforcing veins containing valves as a technique for making valvular prostheses, he tried experiments in 1912 using a graft of jugular vein sutured between the left ventricle and the innominate artery. Hufnagel (104) and Sarnoff and Chase (105) have recently revived interest in attempting to by-pass the aortic valve. Tuffier (106) described an attempt at dilating the aortic valve of a patient by invagination of the wall of the aorta, a surgical feat but without success. The courageous but unsuccessful efforts of Horace Smithy (107) (1940-1946) to solve the problem of aortic stenosis, the disease of which he himself was a victim, emphasized the dangers of creating aortic insufficiency. Undoubtedly spurred by Smithy, Charles Bailey (128) began his series of clinical experiments on digital and instrumental dilation of the diseased valve via the carotid, aorta, and ventricle. A high mortality attended these procedures, but Muller (109) and Harken (110) have found a postoperative reduction in the gradient of pressure as blood flows through the aortic valve. Glenn (111) designed a rubber operating diverticulum through which both the exploring finger and instruments could be placed into the aorta or various chambers of the heart. This and other means of operating through the aorta rendered the operation safer.

An open approach to the problem indeed meets more clearly the surgical standard for clear vision of the operative procedure. In 1953 Clowes and Neville (112) worked out a technique for exposure of the aortic valve during artificial perfusion of the whole body. By clamping the pulmonary artery and the aorta below the innominate artery, the base of the aorta could be opened. Their first patient failed to survive. However, the method was adapted by Swan (113) to operations under hypothermia for visual dilation of the stenotic valve. He reported his first case, who survived, in 1956. Subsequently employing oxygenators and pumps Lillehei (114) and Kay (115) added perfusion of the coronary vessels to permit longer exposure of the valve without damage to the myocardium. Although as many as 56% of the patients have obtained satisfactory results by these methods, the work of MacMillan (116) and others using pulsating flows through diseased valves obtained at autopsy suggests

that the ultimate solution lies in resection of the valve with prosthetic replacement.

Little success has been attained in dealing with aortic regurgitation. This, too, awaits the advent of a successful prosthetic valve. A variety of problems confront the investigators who have attempted such implants: emboli, malfunction, and inadequate anchorage (117) (118) (119). Single leaflets have been replaced by Lillehei (120), but Hufnagel's (121) ball valve, developed in 1947 to be placed in the descending aorta, is the only device to have received any extensive clinical trial.

Congenital Heart Disease

This phase of the history of cardiac surgery is particularly fascinating because of the drama of restoring extremely handicapped and cyanotic children to relatively normal activity and appearance. Following the ligation of a patent ductus by Streider (122) in 1937 (the patient died of gastric dilatation four days postoperatively) and Gross's (13) accomplishment of this operation in 1938, a new field of extracardiac correction of heart failure was opened. Further inroads into the field were made by the successful resection of coarctation of the aorta in 1944 by Crafoord (14), Blalock (123), and Gross (124). The ultimate death from heart failure, cerebral accident, or subacute bacterial endocarditis, which occurred in 75% of these patients, could be averted (125).

Blalock's (15) treatment of the tetralogy of Fallot, first performed in 1944 to create subclavian-pulmonary artery anastomosis, was based upon Taussig's observation of the benefit of a patent ductus to patients with this disease and gave great impetus to the whole field of cardiac surgery. It demonstrated that something constructive could be done for these otherwise hopeless children. This was followed the next year by the aortic-pulmonary artery anastomotic shunt of Potts, Smith, and Gibson (16), utilizing an ingenious aortic clamp. A follow-up by Taussig (126) on the first 1000 patients subjected to the Blalock procedure gave an overall mortality of 15%. That of Potts is similar. While the creation of an artificial ductus is of unquestioned immediate and great benefit to the cyanotic patient, there remain many residual abnormalities in addition to a new ductus imposing an added load on the left ventricle.

This spurred surgeons on to more direct attack on the intracardiac lesions. Actually, Doyen (127) in 1913 attempted relief of pulmonic stenosis (infundibular) in a cyanotic girl by introducing a tenotomy knife through the right ventricle and into the valve. Unfortunately, the patient died four hours after the operation. This was first done with

success by Sellors (128) who, 24 years later, divided a stenotic pulmonic value with a hooked knife. This was repeated by Brock (129) for the correction of cyanosis in 1948. Subsequently, Brock resigned a punch type of instrument for resecting the infundibulum usually causing the stenosis in tetralogy. Many of his results were excellent. Yet in his hands and others the late mortality was high, because of the production of too great a flow in the pulmonary circulation with a reversal of the shunt which resulted in heart failure (130). By both the Blalock procedure and the Brock operation, peripheral arterial oxygen saturation is usually raised to over 90% with a consequent reduction of the hematocrit.

In 1952, Lewis and his colleagues (37) closed under direct vision an atrial septal defect of the secundum type. Swan (131) also has used this method in a large series of patients with outstandingly good results. In 1953, Gibbon, in the first successful open heart operation using extracorporeal circulation, also repaired a similar lesion. In the majority of clinics one or the other technique is now used with an operative mortality well under 5%. However, prior to this, numerous clever methods for closure of the defect were devised including Bailey's atrio-septopexy (132), Gross's (133) atrial well by means of which the auricle could be kept open for operative maneuvers within guided by touch, and Glenn's (111) operating diverticulum which permitted the use of instruments and an exploring finger within a chamber of the heart. Sondegaard (134), in 1954, passed a heavy ligature through the upper edge of the ventricular septum to pull the superior wall of the auricle down to it for closure of the septal defect.

In 1954 Lillehei (48), employing "controlled cross circulation" for perfusion of patients, succeeded in closing the ventricular septal defect and opening up the outflow tract of the right ventricle, thereby correcting the major abnormalities. Since that time he (135) and Kirklin (136) working at the Mayo Clinic, Cooley (137) in Texas, Bahnson (138) in Baltimore, Gerbode (139) in San Francisco, and Lam (140) in Detroit, and many others, using artificial pump oxygenators, have operated upon a large number of patients with an overall operative mortality of about 20%. This, of course, has been improved in the later series as time passed and experience was gained. Cardiac arrest induced during perfusion with potassium citrate injected into the coronary circulation as suggested by Melrose (141) was first applied clinically by Effler and his associates (142). This provided a quiet field for accurate work during cardiotomy. Increased knowledge of the conduction system, which is liable to injury during the closure of ventricular septal defects, has resulted in a decrease

of postoperative heart block. Studies of pulmonary vascular pressures during and after perfusion by Muller, Littlefield, and Dammann (143) and by Kolff et al. (144), and an increase of understanding of the metabolic and respiratory acidosis induced by perfusion by DeWall (145), Clark (146), and Clowes and his colleagues (58) have led to a reduction in pulmonary and blood electrolyte disorders which often resulted in early postoperative deaths. Problems in bleeding have decreased as a better understanding of blood handling was gained (147). An indication of the growing importance of this field is seen in the 1957 congress convened in Chicago by the Surgery Study Section of the National Institutes of Health to discuss all aspects of extracorporeal circulation and its use.

Coronary Artery Disease

The first experiments attempting to increase coronary artery blood flow were started by Claude Beck (148) of Cleveland in 1932. In this work, "revascularization of the heart" was tried in two ways: 1) by production of inflammation of the heart which in time led to the production of intercoronary anastomosis, and 2) by grafting vascularized tissues to the heart in the expectation that blood vessels would grow across from the graft to the heart. Both of these methods led to an increase of survival after ligation of a major coronary artery in experimental animals. In 1936, O'Shaughnessy (149) in England applied omentum to the heart in the hope that this would result in an increase in coronary circulation. Subsequently, he tried this technique in 20 patients, the majority of whom appeared to be improved. Unfortunately, a brilliant career was ended by his death in World War II. In 1937 Gross, Blum, and Silvermann (150) experimentally ligated the coronary sinus with a mortality of 42%. However, in the surviving animals there was an abundant dilation of the intercoronary channels. Robert, Brown, and Roberts (151) reported in 1943 the effects of creating an arterial fistula to the coronary sinus. Beck and his associates took this up in 1946 and devised the Beck II operation (152) consisting of a vein graft between the descending aorta and the coronary sinus. An increase of back flow was demonstrated in a divided artery; also, the mortality from ligating the descending artery was reduced from 70% in the control animals to 20% in those with patent grafts and ligation of the coronary sinus. The technique was tried in man for the first time, January 27, 1948. A high mortality attended the procedure, but apparently the surviving patients for the most part benefited. This was true also in some patients demonstrated to have occluded grafts.

A review of the facts suggested that the benefit derived by all patients and animals from both the Beck I operation (abraiding the surface of the heart to produce inflammation and pericardial adhesions) or the Beck II operation was an increase in intercoronary communications with a more even distribution of blood to all parts of the myocardium (153). Brofman, Leighninger, and Beck (154) observed different electrical potentials between parts of the heart supplied with different quantities of oxygen. From this they coined the term " electrically unstable hearts " which could go into ventricular fibrillation. Therefore, they argued, the objective was to produce more even distribution of blood which could possibly be done by the simpler first operation. In 1956, Beck and Brofman (155) reported no operative mortality in 100 consecutive carefully selected patients. In a follow up averaging two years there was a long term mortality of 13.1% with apparent improvement in the great majority.

Vineberg (156) in Montreal approached the problem by implanting an internal mammary artery into the myocardium, with the development of communications to the coronary vessels demonstrated by injection studies. In 1951, he undertook his first clinical trials which also have been attended by some apparent success.

More recently, Bailey (157) and Longmire (158) undertook endarterectomy of the major coronaries. Dramatic improvement took place in four of Longmire's patients. Cooley (159) repaired a ruptured ventricular septum following a coronary occlusion using temporary cardiopulmonary by-pass.

Summary

Starting in 1897 with Rehn's first successful suture of a wound in a human heart, the history of the development of the techniques and principles of cardiac surgery has been traced. Surgical attack upon the diseases of the pericardium which affect the heart was the first major development started by Delorme in 1898. This was followed many years later by Cutler's first operation upon the mitral valve in 1923 and Souttar's first successful valvulotomy by finger dilation in 1925. The development of surgery for congenital anomalies of the heart and great vessels was started by Gross's successful ligation of the patent ductus in 1938, and great impetus was given heart surgery by the operation of Blalock and Taussig creating an " artificial ductus " for treatment of the Tetralogy of Fallot. This was inevitably followed by the present day success with open heart surgery using hypothermia and artificial perfusion to correct these lesions from within. Finally, the work of Beck and others in their attempts to deal with coronary insufficiency is reviewed. A look

at the future suggests that a variety of prostheses, particularly in the field of artificial valves, may be the next great step. Also, it may be hoped that as control of rheumatic fever takes place, and as more is understood of the causes of congenital malformations of the heart, less need will exist for cardiac surery in the years to come.

BIBLIOGRAPHY

1. Rehn, L.: Über penetrirende Herzwunden und Herznaht. *Verhandl. d. deutsch. Gesellsch. f. Chir.*, 26. Congr., 1897, p. 151.
2. Billroth, T., cited by Jeger, E.: *Die Chirurgie der Blutgefässe und des Herzens.* Berlin: A Hirschwald, 1913, p. 295.
3. Morgagni, J. B.: De Sedibus et Causis Morborum per Anatomen Indagatis. Lovanii, E. Typographica Academica, 1766, Tomus Primus, Epist. 16.
4. Rose, E.: Hertztamponade (ein Beitrag zur Herzchirurgie). *Deutsche Ztschr. f. Chir.*, 1884, *20*: 329.
5. Romero, cited by Paget, S.: *The Surgery of the Chest.* New York: E. B. Treat, 1897.
6. Larrey: *Clinique chirurgicale,* Paris: Gabon, 1829-36, vol. II, pp. 291-302, 315-20 (cited by Cutler).
7. Fischer, G.: Die Wunden des Herzens. *Arch. f. klin. Chir.*, 1868, *9*: 571.
8. Block: In: *Verhandl. d. deutch. Gesellsch. f. Chir.*, 11. Congr., 1882, p. 108.
9. Del Vecchio, S.: Sutura del Cuore. *Riforma med.*, 1895, *2*: 38.
10. His, W., Jr.: *Die Thätigkeit des embryonalen Herzens und deren Bedeutung für die Lehre von der Herzbewegung beim Erwachsenen. Arbeiten aus der medizinischen Klinik zu Leipzig,* 1893.
11. Beck, C.: The operative story of the heart. *Ann. M. Hist.*, 1926, *8*: 224.
12. Carrel, A.: On the experimental surgery of the thoracic aorta and the heart. *Tr. Am. S. A.*, 1910, *28*: 243.
13. Gross, R. E. and Hubbard, J. P.: Surgical ligation of patent ductus arteriosus. *J.A.M.A.*, 1939, *112*: 729.
14. Crafoord, C. and Nylin, G.: Congenital coarctation of the aorta and its surgical treatment. *J. Thoracic Surg.*, 1945, *14*: 347.
15. Blalock, A. and Taussig, H. B.: The surgical treatment of malformations of the heart in which there is pulmonary stenosis or pulmonary atresia. *J. A. M. A.*, 1945, *128*: 189.
16. Potts, W. J., Smith, S., and Gibson, S.: Anastamosis of the aorta to a pulmonary artery, Certain types in congenital heart disease. *J. A. M. A.*, 1942, *132*: 627.
17. Howell, W. H. and Holt, E.: Two new factors in blood coagulation—Heparin and pro-antithrombin. *Am. J. Physiol.*, 1918, *47*: 328.
18. Schede, M.: Die Behandlung der Empyeme. *Verhandl. des Congresses für innere Medicin,* 1890, *9*: 41.
19. Estlander, J. A.: Sur la résection des côtes dans l'empyème chronique. *Revue mensuelle de médecine et de chirurgie,* 1879, *3*: 885.

20. Fowler, G. R.: A case of thoracoplasty for the removal of a large cicatricial fibrous growth from the interior of the chest. *Med. Rec.*, 1893,*44*: 838.
21. Delorme, E.: Nouveau traitement des empyèmes chroniques. *Gaz. d. hôp. Par.*, 1894, *76*: 94.
22. Quénu and Longuet: Note sur quelques recherches expérimentales concernant la chirurgie thoracique. *Compt. rend. Soc. de biol.*, 1896, s. 10, *3*: 1007.
23. Tuffier, T. and Hallion: Opérations intrathoracique avec respiration artificielle par insufflation. *Compt. rend. Soc. de biol.*, 1896, s. 10, *3*: 951.
24. Meltzer, S. J. and Auer, J.: Continuous respiration without respiratory movements. *J. Exper. Med.*, 1909, *11*: 622.
25. Sauerbruch, F.: Über die Ausschaltung der schädlichen Wirkung des Pneumothorax bei intrathorakalen Operationen. *Centralbl. f. Chir.*, 1904, *31*: 146.
26. Beecher, H. K. and Murphy, A. J.: Acidosis during thoracic surgery. *J. Thoracic Surg.*, 1950, *19*: 50.
27. Maier, H. C., Rich, G. W., and Eiben, S.: Clinical significance of respiratory acidosis during operations. *Ann. Surg.*, 1951, *134*: 653.
28. Stead, W. W.: Physiologic studies following thoracic surgery, II. Immediate effects of upper lobectomy combined with a five rib thoracoplasty. *J. Thoracic Surg.*, 1953, *25*: 194.
29. Clowes, G. H. A., Jr., Alichneiwicz, A., Del Guercio, L., and Gillespie, D.: The relationship of postoperative acidosis to pulmonary and cardiovascular function. *J. Thoracic and Cardiovascular Surg.*, 1960, *39*: 1.
30. Moore, F. D.: Bodily changes in surgical convalescence. *Ann. Surg.*, 1953, *137*: 289.
31. Harken, D. E.: Review of the activities of thoracic center for III and IV hospital groups, 160th General Hospital, European Theatre of Operations, June 10, 1944 to Jan. 1, 1945. *J. Thoracic Surg.*, 1946, *15*: 31.
32. Haecker, R.: Experimentelle Studien zur Pathologie und Chirurgie des Herzens. *Arch. f. klin. Chir.*, 1907, *84*: 1035.
33. Cushing, H. and Branch, J. R. B.: Experimental and clinical notes on chronic valvular disease in dog and possible relations to future surgery of cardiac valves. *J. Med. Research*, 1907-8, *17*: 471.
34. Heymans, C., Bouckaert, J. J., Jourdan, F., Nowak, S. J. G., and Faber, S.: Survival and revival of nerve centers following acute anemia. *Arch. Neurol. and Psychiat.*, 1937, *38*: 304.
35. Bigelow, W. G., Lindsay, W. K., Harrison, R. C., Gordon, R. A., and Greenwood, W. F.: Oxygen transport and utilization in dogs at low temperature. *Am. J. Physiol.*, 1950, *160*: 125.
36. Bigelow, W. G., Lindsay, W. K., and Greenwood, W. F.: Hypothermia, its possible role in cardiac surgery. *Ann. Surg.*, 1950, *132*: 849.
37. Lewis, F. J. and Tauffic, M.: Closure of atrial septal defects with the aid of hypothermia: Experimental accomplishments and the report of one successful case. *Surgery*, 1953, *33*: 52.
38. Swan, H., Zeavin, I., Holmer, J. H., and Montgomery, V.: Cessation of circulation in general hypothermia: I. Physiologic changes and their control. *Ann. Surg.*, 1953, *138*: 360.
39. Swan, H., Zeavin, I., Blount, S. G., Jr., and Virtue, R. W.: Surgery by

direct vision in the open heart during hypothermia. *J. A. M. A.*, 1953, *153*: 1081.

40. Dale, H. H. and Schuster, E. H.: A double perfusion pump. *J. Physiol.*, 1928, *64*: 356.
41. Gibbon, J. H., Jr.: Artificial maintenance of circulation during experimental occlusion of the pulmonary artery. *Arch. Surg.*, 1937, *342*: 1105.
42. Sewell, W. H., Jr., and Glenn, W. W. L.: Experimental cardiac surgery: II. Further observations on development of perfusion pump for purpose of shunting venous return directly into pulmonary artery. *Surgical Forum*, Amer. Coll. Surg., 1950, vol. I, p. 265. Philadelphia: W. B. Saunders.
43. Wesolowski, S. A. and Welch, C. S.: Pump mechanism for artificial maintenance of circulation. *Ibid.*, p. 226.
44. Sirak, H. D., Ellison, E. H., and Zollinger, R. M.: Cardiotomy into an empty left ventricle. *Surgery*, 1950, *28*: 225...
45. Kantrowitz, A. and Kantrowitz, A.: Observations on the use of an experimental artificial left heart. *Surgical Forum*, Amer. Coll. Surg., *loc. cit.*, p. 265.
46. Clowes, George H. A., Jr.: Experimental procedures for entry into the left heart to expose the mitral valve. *Ann. Surg.*, 1951, *134*: 957.
47. Dodrill, F. D.: Experiences with the mechanical heart. *J. A. M. A.*, 1954, *154*: 299.
48. Lillehei, C. W., Cohen, M., Warden, H. E., and Varco, R. L.: Direct-vision intracardiac correction of congenital anomalies by controlled cross circulation: Results in thirty-two patients with ventricular septal defects, tetralogy of Fallot, and atrioventricularis communis defects. *Surgery*, 1955, *38*: 11.
49. Bjork, V. O.: An artificial heart or cardiopulmonary machine. *Lancet*, 1948, *2*: 491.
50. Kay, E. B., Zimmerman, H. A., Berne, R. M., Hirose, Yoichi, Jones, R. D., and Cross, F. S.: Certain clinical aspects of the use of a pump oxygenator. *J. A. M. A.*, 1956, *162*: 639.
51. Dennis, C., Spreng, D. S., Jr., Nelson, G. E., Karlson, K. E., Nelson, R. M., Thomas, J. V., Eder, W. P., and Varco, R L.: Development of a pump-oxygenator to replace the heart and lungs: An apparatus applicable to human patients and application to one case. *Ann. Surg.*, 1951, *134*: 709.
52. Clark, L. C., Gollan, F., and Gupta, V. W.: The oxygenation of blood by gas dispersion. *Science*, 1950, *3*: 85.
53. Kolff, W. J., Effler, D. B., Groves, L. K., Peereboom, G., and Morca, P. P.: Disposable membrane oxygenator (Heart-lung machine) and its use in experimental surgery. *Cleveland Clin. Quart.*, 1956, *23*: 69.
54. Clowes, G. H. A., Jr., Hopkins, A. L., and Neville, W. E.: An artificial lung dependent upon diffusion of oxygen and carbon dioxide through plastic membranes. *J. Thoracic Surg.*, 1956, *32*: 630.
55. DeWall, R. A., Warden, H. E., Read, R. C., Gott, V. L., Ziegler, N., Varco, R. L., and Lillehei, C. W.: A simple expendable artificial oxygenator for open heart surgery. *Surg. Clin. N. America*, 1956, *36*: 1025.
56. Lillehei, C. W., Warden, H. E., Varco, R. L., Stanley, P., and DeWall, R. A.:

Use of cardiopulmonary bypass in surgical treatment of congenital or acquired cardiac disease. Use in 305 patients. *Arch. Surg.*, 1957, *75*: 928.

57. Cooley, D. A., DeBakey, M. E., and Morris, C. C.: Controlled extracorporeal circulation in surgical treatment of aortic aneurysms. *Ann. Surg.*, 1957, *146*: 473.
58. Clowes, G. H. A., Jr., Neville, Wm. E., Sabga, G., and Shibota, Y.: The relationship of oxygen consumption, perfusion rate, and temperature to the acidosis associated with cardiopulmonary circulatory bypass. *Surgery*, 1958, *44*: 220.
59. Peirce, E. C., Dabbs, C. H., Rogers, W. K., Rawson, F. L., and Tomkins, R.: Reduced metabolism by means of hypothermia and the low flow pump oxygenator. *Surg. Gynec. & Obst.*, 1958, *107*: 339.
60. Brown, I. W., Jr., Smith, W. W., Young, W. G., and Sealy, W. C.: Experimental and clinical studies of controlled hypothermia rapidly produced and corrected by a blood heat exchanger during extracorporeal circulation. *J. Thoracic Surg.*, 1958, *36*: 497.
61. Churchill, E. D.: Decortication of the heart (Delorme) for adhesive pericarditis. *Arch. Surg.*, 1929, *19*: 1457.
62. Weill, E.: *Traité clinique des maladies du coeur chez les enfants.* Paris: Doin, 1895, p. 128.
63. Delorme, E.: Sur un traitement chirurgical de la symphyse cardio-péricardique. *Bull. et mém. Soc. d. chirurgiens de Paris*, 1898, *24*: 918.
64. Brauer, L.: Die Kardiolysis und ihre Indicationen. *Arch. f. klin. Chir.*, 1903, *71*: 258.
65. Sauerbruch, F.: *Die Chirurgie der Brustorgane.* Berlin: Springer, 1925, vol. II, p. 298.
66. Rehn, L.: Über perikardiale Verwachsungen. *Med. Klin.*, 1920, *16*: 999; Die Chirurgie des Herzens und des Herzbeutels. *Berl. klin. Wchnschr.*, 1913, *50*: 241.
67. Burwell, C. S.: Constrictive pericarditis. *Circulation*, 1957, *15*: 161.
68. Beck, C. S.: Acute and chronic compression of the heart. *Am. Heart J.*, 1937, *14*: 515.
69. Johnson, J. and Kirby, C. K.: A new incision for pericardiectomy. *Ann. Surg.*, 1951, *133*: 540.
70. Cooley, J. C., Clagett, O. T., Kirklin, J. W.: Surgical aspects of constrictive pericarditis. *Ann. Surg.*, 1958, *147*: 488.
71. Churchill, E. D.: Pericardial resection in chronic constrictive pericarditis. *Ann. Surg.*, 1936, *104*: 516.
72. Holman, E. and Willett, F.: Treatment of active tuberculous pericarditis by pericardiectomy. *J. A. M. A.*, 1951, *146*: 1.
73. Brunton, L.: Preliminary note on possibility of treating mitral stenosis by surgical methods. *Lancet*, 1902, *1*: 352.
74. Becker, O.: Über die sichtbaren Erscheinungen der Blutbewegung in der menschlichen Netzhaut. *Arch. f. Ophth.*, 1872, *18*: 206.
75. Klebs, E.: Über operative Verletzungen der Herzklappen und deren Folgen. *Prag. med. Wchnschr.*, 1876, *1*: 29.
76. McCollum, W. G.: On the teaching of pathological physiology. *Bull. Johns Hopkins Hosp.*, 1906, *17*: 251.

77. Carrell A. and Tuffier, T.: Etude anatomopathologique et expérimentale sur la chirurgie des orifices du coeur. *Presse méd.*, 1914, *22*: 173.
78. Allen, D. S. and Graham, E. A.: Intracardiac surgery—New method: preliminary report. *J. A. M. A.*, 1922, *79*: 1028.
79. Cutler, E. C. and Levine, S. A.: Cardiotomy and valvulotomy for mitral stenosis. Experimental observations and clinical notes concerning operated case with recovery. *Boston M. and S. J.*, 1923, *188*: 1023.
80. Powers, J. H.: Surgical treatment of mitral stenosis. *Arch. Surg.*, 1929, *18*: 403.
81. Cutler, E. C. and Beck, C. S.: Surgical procedures in chronic valvular disease of the heart. *Arch. Surg.*, 1929, *18*: 403.
82. Pribram, B. O.: Die operative Behandlung der Mitralstenose. *Arch. f. klin. Chir.*, 1926, *142*: 458.
83. Souttar, H. S.: Surgical treatment of mitral stenosis. *Brit. M. J.*, 1925, *2*: 603.
84. Sweet, R. H. and Bland, E. F.: Surgical relief of congestion in the pulmonary circulation in cases of severe mitral stenosis. *Ann. Surg.*, 1949, *130*: 384.
85. d'Allaines, F., Lenègre, J., Dubost, C., Mathivat, A., and Scebat, L.: L'anastomose veine pulmonaire—veine Azygos dans le rétrécissement mitral à propos d'un cas opéré avec succès. *Arch. d. mal. du coeur*, 1949, *42*: 456.
86. Harken, D. E., Ellis, L. B., Ware, P. F., and Norman, L. R.: The surgical treatment of mitral stenosis. *New England J. Med.*, 1948, *239*: 801.
87. Bailey, C. P.: The surgical treatment of mitral stenosis (Mitral commissurotomy). *Dis. of Chest*, 1949, *15*: 377.
88. Brock, R. C.: Surgery of the heart and great vessels. *Proc. Roy. Soc. Med.*, 1951, *44*: 995.
89. Ellis, L. B., Abelman, W. H., and Harken, D. E.: Selection of patients for mitral and aortic valvuloplasty. *Circulation*, 1957, *15*: 924.
90. Grant, R. T.: After histories for ten years of one thousand men suffering from heart disease. *Heart*, 1933, *16*: 275.
91. Wilson, J. K. and Greenwood, W. F.: The natural history of mitral stenosis. *Canad. M. A. J.*, 1954, *71*: 323.
92. Olesen, K. H.: *Mitral Stenosis: A Follow-up of 351 Patients.* Copenhagen: Ejnar Munksgaards Forlay, 1955, p. 228.
93. Ferrer, M. I., Harvey, R. M., Wyle, R. H., Himmelstein, A., Lambert, A., Kuschner, M., Cournand, A., and Richards, D. W.: Circulatory effects of mitral commissurotomy with particular reference to selection of patients for surgery. *Circulation*, 1955, *12*: 7.
94. Harken, D. E., Black, H., Ellis, L. B., and Dexter, L.: The surgical correction of mitral insufficiency. *J. Thoracic Surg.*, 1954, *28*: 604.
95. Kay, E. B. and Cross, F.: The surgical treatment of mitral insufficiency. *Surgery*, 1955, *37*: 697.
96. Murray, G.: Treatment of mitral valve stenosis by resection and replacement of valve under direct vision. *Arch. Surg.*, 1950, *61*: 903.
97. Glenn, W. W. L., Turk, L. N., and Gentsch, T. O.: The implantation of vascularized grafts in the chambers of the heart. An experimental approach

to correction of valvular insufficiency by vertically suspended graft. *Surgical Forum,* Amer. Coll. Surg., 1954, vol. V, p. 5.

98. Bailey, C. P.: *Surgery of the Heart.* Philadelphia: Lea and Febiger, 1955. p. 734.
99. Glover, R. P. and D'Avila, J. C.: The treatment of mitral insufficiency by the purse-string technique. *J. Thoracic Surg.,* 1957, *33*: 75.
100. Lillehei, C. W., Gott, V. L., DeWall, R. A., and Varco, R. L.: The surgical treatment of stenotic or regurgitant lesions of the mitral and aortic valves by direct vision utilizing a pump oxygenator. *J. Thoracic Surg.,* 1958, *35*: 154.
101. Merendino, K. A. and Bruce, R. A.: One hundred and seventeen surgically treated cases of valvular rheumatic heart disease, with a preliminary report of two cases of mitral regurgitation treated under direct vision with aid of a pump oxygenator. *J. A. M. A.,* 1957, *164*: 749.
102. Kay, E. B., Nogueira, C., Head, L., Coenen, J. J., Zimmerman, H. A.: Surgical treatment of mitral insufficiency. *J. Thoracic Surg.,* 1958, *36*: 677.

102A. Effler, D. B., Groves, L. K., Martinez, W. V., Kolff, W. J.: Open heart surgery for mitral insufficiency. *J. Thoracic Surg.,* 1958, *36*: 665.

103. Jeger, E.: *Die Chirurgie der Blutgefässe und des Herzens.* Berlin: A. Hirschwald, 1913, Chapter 7.
104. Hufnagel, C. A.: Aortic plastic valvular prostheses. *Bull. Georgetown Univ. M. Center,* 1951, *4*: 128.
105. Sarnoff, S. J. and Case, R. B.: Experimental by-pass of the aortic valve by valvular anastomosis between the apex of left ventricle and thoracic aorta. *Cardiovascular Surgery,* Philadelphia: W. B. Saunders, 1955, p. 304.
106. Tuffier, J.: Etat actuel de la chirurgie intra thoracique. *Trans. Internat. Cong. of Med. London,* 1913, Sec. 7, p. 247.
107. Smithy, H. G., Pratt-Thomas, H. R., and Deyerle, H. P.: Experimental aortic valvulotomy: Preliminary report. *Surg., Gynec. and Obst.,* 1947, *84*: 625.
108. Bailey, C. P., Bolton, H. E., Jamison, W. L., and Nichols, H. T.: Experiences in the surgical treatment of aortic stenosis. *J. Thoracic Surg.,* 1954, *28*: 516.
109. Muller, W. H., Kattus, A. A., Jr., Dammann, J. F., and Smith, R. T.: Experiences in the treatment of aortic stenosis. *J. Thoracic Surg.,* 1954, *28*: 516.
110. Harken, D. E., Black, H., Taylor, W. J., Thrower, W. B., Soroff, H. S.: The surgical correction of calcific aortic stenosis in adults, Results of the first 100 consecutive transaortic valvuloplasties. *J. Thoracic Surg.,* 1958, *36*: 759.
111. Glenn, W. W. L., Jaeger, C., Harned, H. S., Whitemore, R., Goodyer, A. V. N., Janzen, A., and Gentsch, T. O.: The diverticulum approach to the chambers of the heart and great vessels. *Surgery,* 1955, *38*: 872.
112. Clowes, G. H. A., Jr. and Neville, William E.: Experimental exposure of the aortic valve. Laboratory studies and a clinical trial. *Surgical Forum,* Amer. Coll. Surg., 1955, vol. V, p. 39.
113. Swan, H. and Kortz, B.: Direct vision trans-aortic approach to the aortic

valve during hypothermia. Experimental observations and report of a successful clinical case. *Ann. Surg.*, 1956, *144*: 205.

114. Lillehei, C. W., Gott, V. L., DeWall, R. A., and Varco, R. L.: The surgical treatment of stenotic or regurgitant lesions of the mitral and aortic valves by direct vision utilizing a pump-oxygenator. *J. Thoracic Surg.*, 1958, *35*: 154.
115. Kay, E. B., Head, L. R., and Nogueira, C.: Direct coronary artery perfusion for aortic valve surgery. *J. A. M. A.*, 1958, *168*: 1767.
116. MacMillan, I. K. R., Daley, R., and Mathews, M. B.: The movement of aortic and pulmonary valves studied postmortem by colour cinematography. *Brit. Heart J.*, 1952, *14*: 42.
117. Kernan, M. C., Newman, M. M., Levowitz, B. S., Stuckey, J. H., and Dennis, C.: A prosthesis to replace the mitral valve. *J. Thoracic Surg.*, 1957, *33*: 698.
118. Roe, B. B., Owsley, J. W., Boudoures, P. C.: Experimental results with a prosthetic aortic valve. *J. Thoracic Surg.*, 1958, *36*: 563
119. Akutsu, T. and Kolff, W. J.: Permanent substitutes for valves and hearts. *Trans. Am. Soc. Artificial Internal Organs*, 1958, *4*: 230.
120. Lillehei, C. W., Barnard, C. N., Gott, V. L., Hodges, P. W., and Varco, R. L.: Surgical correction of aortic insufficiency utilizing cardio-pulmonary by-pass and retroperfusion of coronary sinus. Presented Apr. 16, 1958, at Am. Surg. Assn., New York.
121. Hufnagel, C. A. and Harvey, W. P.: The surgical correction of aortic regurgitation. *Bull. Georgetown Univ. M. Center*, 1953, *6*: 60.
122. Graybiel, A., Streider, J. W., and Boyer, N. H.: An attempt to obliterate patent ductus arteriosus in patients with subacute bacterial endarteritis. *Am. Heart J.*, 1938, *15*: 621.
123. Blalock, A. and Park, E. A.: Surgical treatment of experimental coarctation (atresia) of the aorta. *Am. Surg.*, 1944, *119*: 445.
124. Gross, R. E. and Hufnagel, C. A.: Coarctation of the aorta. *New England J. Med.*, 1945, *223*: 287.
125. Reifenstein, G. H., Levine, S. A., and Gross, R. E.: Coarctation of the aorta. *Am. Heart J.*, 1947, *33*: 146.
126. Taussig, H. B. and Bauersfeld, S. R.: Follow-up studies on the first 1000 patients operated on for pulmonary stenosis or atresia. *Ann. Int. Med.*, 1953, *38*: 1.
127. Doyen, E.: Chirurgie des malformations congénitales ou acquises du coeur. *Presse méd.*, 1913, *21*: 860.
128. Sellors, T. H.: Surgery of pulmonary stenosis. *Lancet*, 1948, *1*: 988.
129. Brock, R. C.: Pulmonary valvulotomy for the relief of congenital pulmonary stenosis. *Brit. M. J.*, 1948, *1*: 1121.
130. Brock, R. C.: Infundibular resection or dilation for infundibular stenosis. *Brit. Heart J.*, 1950, *12*: 403.
131. Swan, H., Kortz, A. B., Davies, H. D., Blount, S. G.: Atrial septal defect, secundum. An analysis of 100 patients undergoing open surgical repair. *J. Thoracic Surg.*, 1959, *37*: 52.
132. Bailey, C. P., Bolton, H. E., Jamison, W. L., and Neptune, W. B.: Atrio-septopexy for interatrial septal defects. *J. Thoracic Surg.*, 1953, *26*: 184.

133. Gross, R. E., Watkins, E., Jr., Pomeranz, A. A., and Goldsmith, E. I.: A method for surgical closure of interauricular septal defects. *Surg., Gynec. and Obst.*, 1953, *96*: 1.

134. Sondegaard, T.: Closure of atrial septal defects. *Acta chir. Scandinav.*, 1954, *107*: 492.

135. Lillehei, C. W.: Contributions of open cardiotomy to the correction of congenital and acquired cardiac disease. *New England J. Med.*, 1958, *258*: 1044.

136. Kirklin J. W., Ellis, F. H., McGoon, D. C., Du Shane, J. W., and Swan, H. J. C.: Surgical treatment for the tetralogy of Fallot by open intracardiac repair. *J. Thoracic Surg.*, 1959, *37*: 22.

137. Cooley, D. A.: Extracorporeal circulation in cardiac surgery. *Surg., Gynec. & Obst.*, 1958, *106*: 615.

138. Bahnson, H. T., Spencer, F. G., Bennett, J. L., Jr.: Staphylococcal infection of the heart and great vessels due to silk sutures. *Ann. Surg.*, 1957, *146*: 399.

139. Gerbode, F., Brainbridge, M., Melrose, D. G.: Median sternotomy for open cardiac surgery during total heart-lung bypass. *Arch. Surg.*, 1958, *76*: 821.

140. Lam, C. R., Gahagan, T., Sergeant, C., and Green, E.: Clinical experiences with induced cardiac arrest during intracardiac surgical procedures. *Ann. Surg.*, 1957, *146*: 439.

141. Melrose, D. G., Dreyer, B., Bentall, H. H., and Baker, J. B.: Elective cardiac arrest. *Lancet*, 1955, *2*: 21.

142. Effler, D. B., Groves, L. K., Sones, F. M., Jr., and Kolff, W. J.: Elective cardiac arrest in open-heart surgery: Report of three cases. *Cleveland Clin, Quart.*, 1956, *23*: 105.

143. Muller, W. H., Littlefield, J. B., and Dammann, J. F.: Pulmonary parenchymal changes associated with cardio-pulmonary bypass. *Extracorporeal Circulation*. Ed. J. Garrott Allen, Springfield, Ill.: Charles C Thomas Co., 1958, p. 336.

144. Kolff, W. J., Effler, D. B., Groves, L. K., Hughes, C. R., McCormack, L. J.: Pulmonary complications of open-heart operation: Their pathogenesis and avoidance. *Cleveland Clin. Quart.*, 1958, *25*: 65.

145. DeWall, R. A., Warden, H. E., Melby, J. C., Minot, H., Varco, R. L., and Lillehei, C. W.: Physiologic responses in 120 patients undergoing total body perfusion with pump-oxygenator for open intra cardiac surgery. *J. A. M. A.*, 1957, *165*: 1788.

146. Clark, L. C., Jr.: Optimal flow rate in perfusion. *Extracorporeal Circulation*. Ed. J. Garrott Allen, Springfield, Ill.: Charles C. Thomas Co., 1958, p. 150.

147. Osborn, J. J., MacKenzie, R., Shaw, A., Perkins, H., Hurt, R., Gerbode, F.: Cause and prevention of hemorrhage following extracorporeal circulation. *Surgical Forum*, Amer. Coll. Surg., 1955, vol. VI, p. 96.

148. Beck, C. S.: The development of a new blood supply to the heart by operation. *Ann. Surg.*, 1935, *102*: 801.

149. O'Shaughnessy, L.: An experimental method for providing a collateral circulation to the heart. *Brit. J. Surg.*, 1936, *23*: 665.

150. Gross, L., Blum, L., and Silverman, G.: Experimental attempts to increase

the blood supply to the dog's heart by means of coronary sinus occlusion. *J. Exper. Med.*, 1937, *65*: 91.

151. Roberts, J. T., Browne, R. S., and Roberts, G.: Nourishment of the myocardium by way of the coronary veins. *Federation Proc.*, 1943, *2*: 90 (March 16).
152. Beck, C. S., Stanton, E., Batisschok, W., and Leiter, E.: Revascularization of the heart by graft of systemic artery into the coronary sinus. *J. A. M. A.*, 1948, *137*: 436.
153. Beck, C. S.: Coronary artery disease—Physiologic concepts—Surgical operation. *Ann. Surg.*, 1957, *145*: 439.
154. Brofman, B. L., Leighninger, D. S., and Beck, C. S.: Electrical instability of the heart. The concept of the current oxygen differential in coronary artery disease. *Circulation*, 1956, *13*: 161.
155. Beck, C. S. and Brofman, B. L.: The surgical management of coronary artery disease: Background, rationale, clinical experiences. *Ann. Int. Med.*, 1956, *45*: 975.
156. Vineberg, A., Munro, D., Cohen, H., and Bullen, W.: Four years' clinical experience with internal mammary artery implantation in the treatment of human coronary artery insufficiency including additional experimental studies. *J. Thoracic Surg.*, 1955, *29*: 1.
157. Bailey, C. P. and May, A.: Survival after coronary endarterectomy in man. *J. A. M. A.*, 1957, *164*: 641.
158. Longmire, W. P., Jr., Cannon, J. A., and Kaltus, A. A.: Direct vision coronary endarterectomy for angina pectoris. *New England J. Med.*, 1958, *259*: 993.
159. Cooley, D. A., Belmonte, B. A., Zeis, L. B., and Schnur, S.: Surgical repair of ruptured interventricular septum following acute myocardial infarction. *Surgery*, 1957, *41*: 930.

BIBLIOGRAPHICAL NOTES ON MEDIEVAL MUSLIM DENTISTRY

FRANZ ROSENTHAL

1. Works on the history of Muslim medicine make no mention whatever of dentistry, with the praiseworthy exception of C. Elgood, *A Medical History of Persia,* who has a few references.[1] General works on the history of dentistry usually devote considerable space to Muslim dentistry but rely exclusively on medieval Latin translations. Original sources were consulted by E. Wiedemann in some of his numerous articles on the history of the sciences. He was quoted and used by K. Sudhoff, *Geschichte der Zahnheilkunde* (2nd ed., Leipzig 1926), who otherwise appears to have relied upon the translations. The comparatively recent notes on oral hygiene by C. Proskauer also show no acquaintance with the original Arabic texts.[2] But the chapter on Muslim dentistry in B. W. Weinberger, *An Introduction to the History of Dentistry, 2,* 195-209 (St. Louis 1948), is based on work done in Arabic sources by E. S. Khalifah and S. I. Haddâd.[2a]

There is, of course, no objection to the use of medieval translations. As a matter of fact, it may be doubted whether there exists any genuinely important material on Muslim dentistry that cannot be found in them. However, they constitute the result of a process of selection made centuries ago, and no matter how well-informed and excellent the choice of the medieval scholars, the modern historian should try to form his own judgment directly on the basis of the original sources wherever available. The philological accuracy of the Latin translations is usually of a very high order, but needless to say, no blind reliance must be placed upon it. Admittedly, a formidable difficulty is the absence of texts edited in accord-

[1] Pp. 180, 249, 252, 286 f. (Cambridge 1951).

[2] *Ciba Symposia, 8,* 443 ff. (1946).

[2a] Dental gleanings from Arabian medicine, *J. Am. Dent. A.,* 1937, *24,* 944-55. Cf. also E. S. Khalifah, Arabian description of dental caries in the tenth century, *ibid.,* pp. 1847-52.

I have had no opportunity to consult a recent article by A. Bobbio, Dentistry in the ancient Arab civilization, which has appeared in the Brazilian periodical, *Revista da Associação Paulista Cirurg. Dent.,* 1957, *11,* 320-41. The article is listed in *Current Work in the History of Medicine* (The Wellcome Historical Medical Library), 1959, *21,* 4, and briefly described in *Dental Abstracts,* 1958, *3,* 720.

ance with even halfway acceptable modern standards. They hardly exist in either Arabic or Latin. The recent publication of the Arabic text of the *Ḥâwî* (*Continens*) by ar-Râzî (d. 925) is a case in point. The edition started to appear in Hyderabad in 1955, and so far eight volumes have been published. The chapter dealing with the diseases of the teeth is contained in vol. *3*, 93-155. A comparison with the Latin (according to the edition Venice, Locatelli, 1506, copy of the New York Academy of Medicine, 55a-60a [3]) shows that the Arabic edition contains as many omissions and errors as the Latin, and probably more. The editors would have greatly profited from consulting the Latin translation. Even so, the mere fact of the availability of the Arabic text is a step forward, and perhaps a satisfactory edition will be published some day, which is more than one can hope for as regards the Latin text. However, under the circumstances, the historian is entitled to feel a bit shortchanged.

2. Dentistry did not develop into a specialty in medieval Muslim civilization. The reason is easy to find. There was, in general, little specialization possible. The misery of toothache was great and much noted, so that poets made it their task to commiserate in verse friends afflicted by it.[4] But it did not rate high in the general scale of human miseries with which physicians were confronted. Considering dentistry a specialty divorced from medicine would have struck medieval physicians as unsound.

As a consequence, the number of monographs written on dental questions was small. Ar-Râzî's sources in the chapter on dentistry in the *Ḥâwî* probably constitute a rather complete listing of the literature then available. They are mainly large medical encyclopedias and works on materia medica.[4a]

It was known to the Arabs that a brief work on teething (*peri odontophyiês*) was current under the name of Hippocrates and that this was one of the works wrongly ascribed to him.[5]

The late Greek physician Philagrios, who lived between 200 and 400 of our era, probably in the fourth century, is credited by Arabic bibliographers with a monograph on the diseases of the gums and the teeth

[3] I regret having been unable to compare the text of the famous first edition (Brescia 1486), being the first to admit that I myself cannot always practice what I preach.

[4] Cf., for instance, ath-Tha'âlibî, *Tatimmat al-Yatîmah*, ed. Abbas Eghbal, *2*, 18 (Teheran 1934); E. G. Browne, *A Literary History of Persia, 2*, 373 (London 1902-24).

[4a] The dissertation by R. R. Tittmann, *Was berichtet der arabische Arzt Rhazes in seinem "Continens" aus griechischen Ärzten über Zahnheilkunde* (Leipzig 1925), could not be consulted.

[5] Ibn Abî Uṣaybi'ah, *'Uyûn al-anbâ'*, ed. A. Müller, *1*, $32_{24f.}$ (Cairo-Königsberg 1882-84).

(*Fî-mâ ya'riḍu li-l-lithah wa-l-asnân*). This work is said to have been translated into Arabic by a certain Abû l-Ḥasan al-Ḥarrânî.[6] The Latin text of the *Hâwî* (55b, col. a) cites Filogorius, *Ad commune*. The Arabic text (97) has "Rufus, *To the Common People*," a work often cited. However, in later passages of the *Continens*, Philagrios (if this is the correct reading) is in fact credited with a work *To the Common People* (*ilâ l-'awâmm*, or *ilâ l-'âmmah*), also referred to as his "*Small Medical Encyclopedia* (*kunnâsh*), which is the work *To the Common People* (Arabic text, *5*, 169, 207, 218; *7*, 297; *8*, 41)." At any rate, Philagrios' work on dentistry cannot be meant here.

The famous Christian translator, Ḥunayn b. Isḥâq (d. 873), wrote a monograph on *The Teeth and the Gums*. A manuscript of the work is said to exist in private possession but is not accessible at present.[7] Ar-Râzî has preserved a number of quotations, citing the work with slightly different titles: *On the Conservation of the Teeth and the Gums* (107 f.); *On the Corrective Treatment* (*iṣlâḥ*) *of the Teeth* (138; the Latin text, 59a, col. a, omits the name of Ḥunayn); and *On the Corrective Treatment of the Gums and the Tongue* (*sic*, apparently a misprint for "teeth," 145). Quotations of Ḥunayn without indication of a title may refer to this work. Outside the chapter on dentistry, Ḥunayn's work is cited by ar-Râzî, *5*, 58; *6*, 36 and (probably) 63, again with slightly different titles: *On the Conservation of the Teeth; On the Regimen* (*tadbîr*) *of the Teeth;* and, simply, *The Teeth.*

Also in the ninth century but somewhat earlier than Ḥunayn, Yuḥannâ b. Mâsawayh (the "filius Mesue" of the Latin translators) wrote *On the Siwâk and* (*Other*) *Dentifrices.*[8] Ar-Râzî cites Ibn Mâsawayh's *Problems* (*Masâ'il*) (117) and *On Purgation* (*Kitâb al-Ishâl*) (154), both works undoubtedly not restricted to matters concerning the teeth. Quotations from Ibn Mâsawayh without indication of a title (126, 134,

[6] Ibn an-Nadim, *Fihrist*, ed. G. Flügel, 292 (Leipzig 1871-72); 406 (Cairo 1348/1929-30); Ibn Abi Uṣaybi'ah, *1*, 103$_{28}$; M. Steinschneider, in (*Virchow's*) *Archiv für pathologische Anatomie, 124*, 474 f. (1891).

Ibn an-Nadim, 303/421, identified Abû l-Ḥasan al-Ḥarrâni as Thâbit b. Ibrâhim b. Zahrûn (897-980). This may be correct. In this case, ar-Râzi, who died in 925, is unlikely to have known the translation of this particular work ascribed to Philagrios, if it was indeed produced before his death.

[7] Ibn an-Nadim, 294/410; al-Qifṭi, ed. A. Müller and J. Lippert, 173 (Leipzig 1903); Ibn Abi Uṣaybi'ah, *1*, 199$_{28}$, 200$_{28}$. In the first place, Ibn Abi Uṣaybi'ah has the title: *On the Conservation of the Teeth and the Gums*, and in the second: *On the Conservation of the Teeth.* The reference is certain to be to one and the same work.

The manuscript in private possession is listed by P. Sbath, *Al-Fihris, 1*, 43 (Cairo 1938-40).

[8] Ibn Abi Uṣaybi'ah, *1*, 183$_{28}$.

141 f., 150) could go back to his work on dentifrices, but this is, of course, uncertain.

A little problem is presented by ar-Râzî's citation of 'Îsâ b. Mâsawayh, *On the Regimen of the Teeth* (*tadbîr al-snh*) (150). Arabic *al-snh* is doubtful and admits of various interpretations; if it is to mean "teeth," a slight correction is required, presupposing another misprint. The Latin has *de libro Ysa filii Nase de regimine dentium* (60a, col. a). Now, we know of no physician 'Îsâ b. Mâsawayh. The Ysa f. Nase of the Latin text is the well-known 'Îsâ b. Mâsah, another ninth-century physician. However, the bibliographers do not make mention of a monograph on dentistry by him.[9] Another physician of a similar name, 'Îsâ b. Mâsarjîs, is also not known as an author on the subject.[10] For the time being, the most likely assumption would seem to be that 'Îsâ b. Mâsah wrote a monograph now lost, entitled *Regimen of the Teeth*. But it should be noted that ar-Râzî elsewhere (*6*, 87) cites a book by 'Îsâ b. Mâsah entitled simply *On the Regimen* (*fî t-tadbîr*).

A monograph dealing with the affliction of the teeth called *ḍaras* (*stupor dentium*, or *congelatio*, cf., in particular, ar-Râzî, *3*, 151) is ascribed in a manuscript in private possession to another famous ninth-century scholar, Qusṭâ b. Lûqâ.[10a]

As one can see, all these monographs on dentistry date back to the earliest times of Arabic scientific endeavor. In later periods, none seem to have been written. Works on the *siwâk* are religio-legal discussions dealing with traditions and statements recommending its use.

3. Since dentistry did not become a specialty, dental diseases were treated by general practitioners. We would conclude this to be the case from the fact that the teeth, their diseases and their treatment, are dealt with in medical handbooks and encyclopedias. Direct references to dental treatment by physicians are, however, rare. Information comes from a rather unexpected source, poetry. The great mystic, Jalâl-ad-dîn Rûmî (1207-73), said in his monumental Persian poem, the *Mathnavî* (*1*, verse 3870, quoted by Elgood, *op. cit.*, 249, in the translation of R. A. Nicholson[11]):

> The physician extracts bad teeth, in order that the
> beloved (patient) may be saved from pain and sickness.

[9] Ibn an-Nadîm, 296/412; al-Qifṭî, 246; Ibn Abî Uṣaybi'ah, *1*, 184. Manuscripts of works by 'Îsâ b. Mâsah are listed by Sbath, *op. cit.*, *1*, 55.

[10] Ibn an-Nadîm, 297/414; al-Qifṭî, 247; Ibn Abî Uṣaybi'ah, *1*, 204.

[10a] Sbath, *op. cit.*, *1*, 60.

[11] Cambridge-London 1925-40, *E. J. W. Gibb Memorial Series, N.S. 4*.

And the prolific poet, Ṣafi-ad-din al-Ḥilli (d. 1349), composed these humorous verses on a handsome boy who had a tooth extracted: [12]

> God curse the physician who has trespassed
> And come to cut out your tooth artfully.
>
> He has held fast the fawn in both his hands
> And given two bitches (the forceps) power over a gazelle.

The ordinary word for the forceps used in the extraction of molars is *kalbatân*,[13] which may also mean "two bitches." Fawn and gazelle are terms used for handsome boys and girls.

Tooth extraction could also be done by a medical specialist, the surgeon. A seventeenth-century (?) surgeon's license (*ijâzah*) granted by the chief surgeon of a Cairo hospital permits the licensee, among other things, which include cupping, also to extract bad teeth.[14]

We may assume that barbers, who also worked as cuppers, practiced extraction, but no medieval reference is at hand.[15] Charlatans who claimed to be able to cure toothaches were certainly common. They were probably "specialists" in the sense that at a given appearance they restricted themselves to the treatment of toothaches. Their favorite activity was the extraction of worms that allegedly caused the pain.[16] The belief in toothworms was, according to a spurious tradition, ascribed to the Prophet Muḥammad himself who "used to eat cold things, saying, 'It kills the worm in the teeth.'" [17]

4. These are a few examples of the information on dental matters to be found in medical and scientific works of the ninth and tenth centuries:

The Book of Treasures, composed in Syriac by Job of Edessa (Ayyûb ar-Ruhâwi), who lived around 800 A. D., is not a medical work but a

[12] *Dîwân*, 331 (Damascus 1297/1880); al-Kutubi, *Fawât al-Wafayât*, *1*, 594 (Cairo 1951).

[13] Cf., for instance, 'Alî b. al-'Abbâs al-Majûsi, *Kâmil*, *2*, 478 (Bûlâq 1294/1877).

[14] Cf. Aḥmad 'Îsâ Bey, *Ta'rîkh al-bimâristânât fî l-Islâm*, 47 (Damascus 1357/1939 [rather, 1358/1940]).

[15] For alleged modern survivals of medieval conditions, cf. Mahmut Bakal, *A Village in Anatolia*, trans. W. Deedes, 167 ff. (London 1954).

[16] Cf. E. Wiedemann, *Beiträge zur Geschichte der Naturwissenschaften*, *25*, in *Sitzungsberichte der physikalisch-medizinischen Sozietät in Erlangen*, *43*, 223 ff. (1911); M. Meyerhof, *Bull. Hist. Med.* 1945, *17*, 203 f; Elgood, *op. cit.*, 252. Cf. also Ibn Juljul, *Les générations des médecins*, ed. F. Sayyid, 43 (Cairo 1955), where Galen is quoted for an encounter with a charlatan who claimed that he had learned from Galen about a medicine against toothworms. As his source, Ibn Juljul mentions "Galen's work on *Diseases that are difficult to cure.*"

[17] Al-Ḥubayshi (Ḥabashî), *al-Barakah fî faḍl as-sa'y wa-l-ḥarakah*, 251 (Cairo 1354/1935-36).

general scientific encyclopedia. It deals with the question why teeth originate in the mouth and not elsewhere in the body, why they number thirty-two, how they originate, and what uses they serve.[18]

The lapidary ascribed to Aristotle existed in Arabic form no later than the early ninth century. It refers to minerals that may be used for polishing the teeth, for strengthening the gums, and stopping the throbbing of teeth.[19]

'Alī b. Rabban aṭ-Ṭabarī wrote his medical handbook, entitled *Paradise of Wisdom* (*Firdaws al-ḥikmah*), in the first half of the ninth century. The author incidentally speaks about teething. He refers to excessive consumption of sweet, sour, hot, and cold foods as harmful to the teeth and claims that the teeth are harmed if one eats something hot immediately after something cold, and vice versa. The main discussion of the mouth, the teeth, and foul breath includes references to medications for such purposes as speeding the teething of babies, or fastening loose teeth, and eliminating bleeding of the gums.[20] Foul breath as the result of bad teeth that are yellowish and affected by caries requires extraction if the tooth is too far gone, or the even filing off of the parts affected by caries, also cauterizing of the gums.[21]

The Treasure (*Kitâb adh-Dhakhîrah*) may be wrongly ascribed to the great ninth-century scientist, Thâbit b. Qurrah, but it does date from his period. The author discusses whether or not any sense perception is located in the teeth, a question that we find also discussed in the *Bustân al-aṭibbâ'* of Ibn al-Maṭrân in the twelfth century.[22] He further describes various diseases affecting the teeth and indicates the appropriate medication.[23]

The tenth-century al-Ḥasan b. Nûḥ al-Qumrî, in his *Kitâb al-Ghinâ wa-l-munâ*, starts out by explaining that toothache results from affection of the nerve at the base of the tooth by blood or phlegm, as is proven by the fact that the pain stops as soon as the aching tooth is extracted. He then goes into details as to treatment and medication.[24]

[18] Ed., trans. A. Mingana, ch. 11 (Cambridge 1935).

[19] J. Ruska, *Das Steinbuch des Aristoteles*, text, 113, 120, 124, trans., 162, 176, 181 (Heidelberg 1912).

[20] The late King 'Abdallâh of Transjordan, when he was a boy, was repelled by the unsanitary and irreligious habit of a teacher suffering from bleeding gums who licked his pen and put it back into the inkstand covered with blood, cf. *Memoirs of King Abdullah of Transjordan*, ed. P. P. Graves, 35 (London 1950).

[21] Ed. M. Z. Siddiqi, 98, 114, 124, 187 ff. (Berlin 1928).

[22] Ms. Army Medical Library A 8. Cf. also Ibn Hubal, *Mukhtârât, 3*, 174 (Hyderabad 1362-64).

[23] Ed. G. Sobhy, 49-52 (Cairo 1928). Cf. M. Meyerhof, in *Isis, 14*, 64 (1930).

[24] British Museum, Ms. or. 6623, 51b-54a. Qumrî is the form of the name used in

In a minor Persian treatise ascribed to Ibn Sînâ (d. 1037), the author speaks briefly about toothache and mentions useful remedies. He begins, "If the toothache is caused by the wind. . . ."[25] For the belief that the wind may bring on toothaches, we have, for instance, verses of Rûmî's *Mathnavî* (*4*, verse 149, and *6*, verses 4683-85, in the translation of R. A. Nicholson):

> Likewise, in (the case of) toothache you beg ardently and earnestly to be defended from the wind.
>
> See how the wind passes through the mouth, coming and going at every moment in advance and retreat.
>
> The throat and the teeth are in no danger from it; (but) when God commands, it attacks the teeth;
>
> (And then) a (mere) atom of wind becomes (like) a mountain and heavy, and toothache keeps (the sufferer) miserable and ill.

5. Folklore concerning human and animal teeth was collected by the brilliant tenth-century littérateur Abû Ḥayyân at-Tawḥîdî in his *Kitâb al-Imtâʿ wa-l-muʾânasah*.[26]

Works on physiognomy paid some attention to the teeth. Weak and thin teeth indicate a weak body. Long canines are indicative of a greedy, evil disposition.[27] Knowledge of this sort was of practical importance for the slave buyer. Therefore, we find it mentioned in a treatise on the buying and selling of slaves by the eleventh-century Christian physician Ibn Buṭlân. The buyer is moreover advised to realize that permanent teeth once lost do not grow again. He must make sure that the teeth of his prospective slave are healthy and strong and close together, although, Ibn Buṭlân adds, the Arabs find thin and spaced teeth more attractive. On the other hand, advice as to suitable dentifrices for polishing the teeth is probably directed toward the seller who wants to give his merchandise greater sales appeal.[28]

scholarly literature (C. Brockelmann, *Geschichte der arabischen Litteratur, Suppl., 1*, 425; H. Ritter, in *Oriens, 3*, 86 [1950]). However, the ms. has Qamri (*leg.* Qamari ?), and it remains to be discovered which vocalization is the correct one.

[25] *Risâle-i Jûdiye*, 9 f. (Teheran 1330/1370/1951).

[26] *1*, 160 (Cairo 1939-44), trans. L. Knopf, in *Osiris, 12*, 404 f. (1956).

[27] Youssef Mourad, *La physiognomonie arabe et le Kitâb al-Firâsa de Fakhr al-Dîn al-Râsî*, text, 68, trans., 121 (Paris 1939).

[28] *Risâlah fî shirâ ar-raqîq*, ed. 'Abd-as-Salâm Hârûn, *Nawâdir al-makhṭûṭât, 4*, 361 368, 381 (Cairo 1954). Cf. also M. Ghazzâli (seventeenth century ?), *Hidâyat al-murîd ibid.*, 401.

If it turns out that a newly purchased slave is suffering from constantly recurring toothaches, it is permissible to return that slave to the seller.[29]

6. In Muslim civilization, one would expect to find religious sentiment and legal scholarship to be concerned with the afflictions of the teeth. Was it becoming for a pious man to complain about a severe toothache or not? The Persian poet 'Aṭṭâr (ca. 1200) pondered the question.[30] Prayers of a special composition were described as helpful against toothaches by aṭ-Ṭabarsî in the first half of the twelfth century, and on high religious authority, the same author has also some incantations to recommend for the cure of aching teeth.[31]

Jurists had an opportunity to discuss the various legal situations arising from damage done to somebody's teeth. Many details were to be considered, such as the previous condition of the damaged tooth, etc. Also, was there a legal case if a tooth was kicked out that was not the original tooth but a replacement made of gold or some other material or of the tooth of a sheep or some other animal?[32] The permissibility of the use of artificial teeth held in place with the help of metal—"binding (fastening) the teeth with (gold, etc.)" being the literal translation of the Arabic—constituted a problem for jurists. Since gold was used for this purpose, there was some doubt as to whether this would fall under the law forbidding men to use precious metals for adornment or ostentation, and thus the matter had to be discussed.

The caliph 'Uthmân (d. 656) is reported to have used gold wiring of this sort for his teeth.[33] We may accept this report as historical. However, no mention of this precedent is made by jurists, not because they were unaware of it but evidently because 'Uthmân was a controversial figure, and his precedent did not count. According to at-Tirmidhî, the ninth-century author of an authoritative collection of Prophetical traditions, there existed another justification for the practice of using gold wiring, which was not uncommon in his days. This was an analogous

[29] Qâḍikhân, *Fatâwî*, *2*, 415 (Calcutta 1835).

[30] Cf. H. Ritter, *Das Meer der Seele*, 61, 236 (Leiden 1955).

[31] *Makârim al-akhlâq*, 155 f., 168 f. (Cairo 1304/1886-87). Cf. also Ibn Qayyim al-Jawziyah, *aṭ-Ṭibb an-nabawî*, 279 (Mecca-Cairo 1377/1957).

[32] Ash-Shâfi'î (d. 820), *Kitâb al-Umm*, *6*, 110-14 (Cairo 1321-25/1903-7).

For legal problems concerning dentistry in Judaism, cf. V. B. Gauval, Notes sur l'histoire de l'art dentaire dans la Bible et le Talmud, *Revue d'histoire de la médecine hébraïque*, 1958, *11*: 63-70.

[33] Cf. E. Wiedemann, *Beiträge*, *45*, in *Sitzungsberichte . . . Erlangen*, *47*, 129 (1915). Another old source not yet available in Wiedemann's time is al-Balâdhurî, *Ansâb*, ed. S. D. F. Goitein, *5*, 87 (Jerusalem 1936). Cf. also, in general, V. Guerini, *A History of Dentistry*, 135 f. (Philadelphia-New York 1909); Sudhoff, *op. cit.*, 115, 119 ff.

case from the Prophet's time. A certain 'Arfajah b. As'ad had lost his nose in battle before the coming of Islam and he used a silver prosthesis. This prosthesis later annoyed him on account of its smell, and Muḥammad advised him to use one of gold.[84]

The afore-mentioned Ṭabarsî treats the subject as follows:

Al-Ḥalabî asked Abû 'Abdallâh (Ja'far aṣ-Ṣâdiq, the sixth *imâm* of the Shî'ah) whether it was all right to have a damaged incisor fastened with gold or, if it had fallen out, to have it replaced by the incisor of a sheep. He replied in the affirmative that, if desired, the incisor of a sheep or any other animal usable for legal slaughtering would do. 'Abdallâh b. Sinân asked Abû 'Abdallâh the same question and received the same reply, namely, that he might either fasten it or replace it with the tooth of an animal usable for legal slaughtering. Zurârah (b. A'yan) said that in his presence his father asked Abû 'Abdallâh whether it was permissible for a man who had lost a tooth to replace it with the tooth of a dead man, and Abû 'Abdallâh replied that there was no harm in it.[85]

While aṭ-Ṭabarsî was a Shî'ah and his statement reflects Shî'ah law, we have an exposition of the Ḥanafite point of view in the legal *Responsa* of his contemporary, Qâḍîkhân:

(According to Abû Yûsuf [d. 798] . . .), if a loose incisor does not fall out but it is feared that it may, there is no harm in fastening it with gold or silver, as this is not comparable to using (gold or silver) jewelry. In the opinion of Abû Ḥanifah (d. 767), the putting back and fastening of an incisor that has fallen out is something to be disapproved of; the tooth should rather be replaced by a (ritually) clean sheep's tooth. Abû Yûsuf, on the other hand, is of the opinion that there is no harm in fastening the same tooth back in its place, as this is not the same as using the tooth of a dead person (which would be objectionable). In the *Jâmi' aṣ-ṣaghîr*, (Muḥammad ash-Shaybânî [d. 804]) mentions that if a tooth is loose, it should be fastened with gold. He says that there is no harm in this. It agrees with the first opinion of Abû Ḥanîfah. Finally, he says that it should be fastened with silver, not with gold. There is a difference of opinion concerning the statement of Abû Yûsuf. Abû Ḥanîfah used to see no harm in having the tooth fastened with silver. Likewise, if a tooth falls out, there is no harm in replacing it with a tooth of silver, but one disapproves of replacing it with one of gold.[86]

The jurists' approach may not seem enlightened or practical, but like all the little details mentioned here, it has a certain historical significance and calls for further study.

[84] At-Tirmidhî, *Ṣaḥîḥ*, *6*, 269 ff. (Cairo 1350/1931), referred to in A. J. Wensinck and others, *Concordance et indices de la tradition musulmane*, *2*, 555a (Leiden 1933—). For 'Arfajah and his story, cf., for instance, al-Bukhârî, *Ta'rîkh*, *4*, *1*, 64 f. (Hyderabad 1360—/1941—).

[85] Aṭ-Ṭabarsî, *op. cit.*, 39.

[86] Qâḍîkhân, *op. cit.* (fn. 29), *4*, 389 f.

THE FIRST CHOLERA EPIDEMIC AND SOCIAL HISTORY

R. E. McGREW

In 1817 a new and devastating epidemic broke out in British India, ravaged South East Asia, penetrated the Chinese Empire, and, by 1822, swept into Japan. During the same period the pestilence moved westward, reaching the East African shore in 1820, spreading over Mesopotamia and Persia, and in 1823, extending to Tiflis, Baku, and Astrakhan, the gateway to Russia and the West. This disease showed some resemblance to the cholera, or bilious flux, described in works from Hippocrates to Sydenham, and so the scourge was named. In its terrible morbidity and its pandemic character, however, the new cholera was obviously something more than the disease the ancients mentioned, and European physicians christened it variously *cholera asiatica, cholera indica, cholera spasmodica,* and, in tribute to its deathly powers *cholera morbus.*[1]

Since the disease appeared in British territories, Europe soon knew its nature and its progress. British medical observers in India published reports which fostered articles in popular periodicals as well as professional journals.[2] These early writings stressed scientific inquiry, but as the cholera drew nearer, urgency conquered objectivity, or, as the London *Medico-Chirurgical Review* put it, " In Asia the fiend was contemplated by us with curiosity—in the wilds of Russia, wth suspicion—in

[1] For a brief account of cholera's spread, *see*: Dr. August Hirsch, *Handbook of Geographical and Historical Pathology,* tr. Charles Creighton, M. D., London: New Sydenham Society, 1883, vol. I, pp. 394 ff. A recent account is R. Pollitzer, M. D., "Cholera studies: History of the disease," *Bulletin of the World Health Organization,* 1954, *10*: 421-461. Contemporary literature concerning the etymology of "cholera" presents several interesting theses. *See,* for example, James Keir, M. D., *A Treatise on Cholera, Containing the Author's Experience of the Epidemic Known by that Name as it Prevailed in the City of Moscow in Autumn of 1830, and Winter, 1831,* Edinburgh: Black, 1832, pp. 1-30; Ambroise Tardieu, *Du choléra épidémique: leçons professées à la faculté de médecine de Paris,* Paris: Germer-Baillière, 1849, pp. 1-7. Tardieu denies the Greek derivation and subscribes to a Hebrew origin. *See also: Gazette médicale de Paris,* 1832, p. 359, on which Tardieu bases his thesis.

[2] The reports included James Jameson, *Report on the Epidemic Cholera Morbus as it Visited the Territories Subject to the Presidency of Bengal in the Years 1817, 1818, and 1819,* Calcutta, 1820; W. Scot, *Report on the Epidemic Cholera as it Appeared in the Territories Subject to the Presidency of Fort St. George,* Madras, 1823; *Report on the Epidemic Cholera which has Raged throughout Hindustan and the Peninsula of India since August, 1817,* Bombay, 1819.

Germany with alarm—but on English soil, with TERROR!"[3] The Russian empire, first among the European states to meet the terror, formulated an anti-cholera program in 1823. Thanks to the importunities of a far-sighted German physician in the Russian service, a Dr. Rehmann, Tsar Alexander I established a combined medical-administrative board which became the prototype, if not the progenitor, of similar medical councils which subsequently appeared in Europe.[4]

From 1823 to 1829 the cholera remained outside Europe, but in the latter year it again attacked the Russian Empire and in 1830 began its inexorable movement along the Russian river system, a movement which by 1832 had carried it across Western Europe into England and finally to the Americas. While the cholera raged in Russia, special deputations arrived from the West to observe Russian methods.[5] Their reports were not optimistic, for though most would have agreed with Imperial Physician in Ordinary, Dr. Rauch, that "the cholera will not be cured by nature's powers alone without the help of art . . . ," it was obvious that no particular method was universally applicable.[6] The Russian failure to stem the epidemic or to develop a rational and successful treatment was repeated with hopeless regularity in Europe and the New World, and by 1835 the first cholera epidemic had claimed its hundred thousands and had left its special mark on society.

Modern historians generally have failed to assess disease's vital influence in historical development, and when they have dealt with it, it has usually been in descriptive rather than analytic terms.[7] The first

[3] "Epidemic Cholera," London *Medico-Chirurgical Review*, 1832, n. s. *16*: 163.

[4] In 1823 Rehmann was head of the Civil-Medical Council. He argued trenchantly that both Russia and Europe were in danger, and he suggested that only the seas and the ocean could contain the disease. His pleas were heard first by the Minister of the Interior and then by the Council of Ministers. The special committee was formed in October, 1823. *See*: J. R. Lichtenstädt, *Die asiatische Cholera in Russland in den Jahren 1830-1831: nach russischen Aktenstücken und Berichten*, Berlin: Josephy, 1831, pp. 125-126.

[5] The deputations produced voluminous reports, and these, together with communications to learned societies and popular and professional journals, provide massive documentation for current diagnostic and therapeutic methods. Among the best examples of this literature is William Russell and D. Barry, *Official Reports Made to Government by Drs. Russell and Barry on the Disease Called Cholera Spasmodica as Observed by them during their Mission to Russia in 1831*, London, 1832.

[6] Rauch, "Bemerkung über die Cholera-Epidemie in St. Petersburg," Jeremias Lichtenstädt, *Mittheilungen über die Cholera-Epidemie zu St. Petersburg im Sommer 1831*, St. Petersburg, 1831 (?), pp. 33; 35 ff. This volume was prepared at the request of Rehmann and the Civil-Medical Council to provide information on what was being done by practising physicians.

[7] Charles F. Mullett, *The Bubonic Plague in England*, Lexington, Kentucky: Univ.

cholera epidemic is a case in point. The cholera has been at most something to mention in passing, an event which should be noted, but which, when compared with political or military facts, was unimportant. It is interesting, for example, that the *Cambridge Modern History*'s chronological table of leading events makes no mention of the cholera, though it lists the death of Simon Bolívar, the publication of Victor Hugo's *Hernani,* and the death of Casimir Périer. The latter, incidentally, died of the cholera, a fact which is just mentioned in the text and nothing more. It is even more telling, however, that in discussing the aftermath of the French revolutions of 1830, the English Reform Bill of 1832, and the Polish revolt of 1830-1831, the cholera is scarcely mentioned, and where it is mentioned, it is given no part in those events. Yet as we shall note below, in each of these instances, epidemic cholera was an important factor.[8]

Perhaps it is unfair to criticize these failures, for the growth of social history as a legitimate discipline is of fairly recent vintage and owes its foundation to the marriage of the empirical-sociological tradition of Comte, Marx, and Weber with the social psychology of LeBon and Freud. The social significance which can be attached to medical history, and particularly to the impact of epidemic disease, in part arises from these combined disciplines. In one sense, of course, this approach is as old as Thucydides, whose *History* reflects the assumptions of Hippocratic psychology, and whose analysis of the social impact of the plague is classic. Nevertheless, in another sense, this approach is very new, for it unites the insights of several recent and highly developed disciplines which provide both new proofs and new methods. It is precisely in this union that William L. Langer has found history's new horizons. In his presidential address to the American Historical Association, Professor Langer noted that social psychology has made great strides in understanding mass behavior, and he suggested that traumatic experience marks society's

of Kentucky Press, 1956, provides a striking exception. *See also* the same author's "Medical history: Some problems and opportunities," *J. Hist. Med. & Allied Sc.,* 1946, *1*: 189-207.

[8] *Cambridge Modern History,* corrected edition, New York and Cambridge, 1934, vol. X, pp. 788-789; 486-488; 465-474; 613-616. It was noted that both Casimir Périer and General Lamarque died of the cholera, but the epidemic was not otherwise related to the events of 1832-1833. Other histories were somewhat more generous in noting the cholera's appearance. *See* for example: Alfred Stern, *Geschichte Europas,* Band I, Stuttgart und Berlin, 1905, pp. 160-161; 508-509. N. K. Shilder, *Imperator Nikolai pervyi: ego zhizn i tsarstvovanie,* 2 vols., St. Petersburg, 1903, vol. II, pp. 361 ff. Theodor Schiemann, *Geschichte Russlands unter Kaiser Nikolaus I,* 4 vols., Berlin 1904-1919, vol. III, pp. 31-37.

collective mind even as it scores the individual's subconscious. Epidemic disease was the example which he chose to illustrate his thesis, and he emphasized the great plagues of early modern Europe and their influence on the Reformation.[9]

The general point which Langer made is reflected in a series of recent publications concerning the first cholera epidemic. In general these studies underscore the importance of disease for social history, and specifically they delineate areas to be studied and methods to be used. In this respect they represent a contribution to an important area of historical scholarship and warrant a brief survey which should be suggestive of future work.

Several factors unite to give the cholera special significance for social history. The nature of the disease, its mode of communication, and especially its connection with unsanitary living conditions and polluted water supplies, meant that the cholera would claim its greatest number of victims among the lower classes. It therefore offers a unique opportunity to penetrate class structure, social attitudes, and the living conditions of a broad segment of the population. The bulk of the studies which have appeared have concentrated on urban centers, and through the cholera have analyzed demographic patterns and social attitudes in New York, London, Paris, Lille, Lyon, Bordeaux, and Marseilles, among others.[10] While far less work has been done in non-urban cultures, there is suggestive material concerning Mexico, Canada, and Russia.[11] Apart from static social analysis, however, it should be remembered that in Europe the cholera struck in a period of social unrest and disturbance. Consequently the reactions engendered by the epidemic became a part of the revolutionary flux and played a significant part in intensifying social disturbances.[12]

[9] William L. Langer, "The next assignment," *American Historical Review*, 1958, *63*: 283-304.

[10] *See*: Charles E. Rosenberg, "The cholera epidemic of 1832 in New York City," *Bull. Hist. Med.*, 1959, *33*: 37-49; P. Freour et al., "L'épidémie de choléra à Bordeaux en 1832," *J. de méd. de Bordeaux*, 1958, #6, Juin: 545-549. Louis Chevalier, *Le choléra: la première épidémie du XIX^e siècle*, La Roche-sur-Yon: Imprimerie Centrale de l'Ouest, 1958. Chevalier's work is a collection of essays, some of which are noted individually below. Cited hereafter as Chevalier, *Le choléra*.

[11] *See*: C. A. Hutchinson, "The Asiatic cholera epidemic of 1833 in Mexico," *Bull. Hist. Med.*, 1958, *32*: 1-23; 152-163; Marian A. Patterson, "The cholera epidemic of 1832 in York, Upper Canada," *Bull. M. Lib. A.*, 1958, *46*: 165-184; M.-V. Netchkina, et al., "Le choléra en Russie," in Chevalier, *Le choléra*, pp. 143-155.

[12] *See* Louis Chevalier, *Classes laborieuses et classes dangereuses à Paris pendant la première moitié du XIX^e siècle*, Paris, 1958.

Even as the period of the first cholera epidemics was a period of turbulence, so also it was a period of reform. The cholera played an immediate role in forwarding sanitation reform, urban development, and public health administration. In turn, in its organizational aspects, the last mentioned affected social reform programs in general and helped to create a better understanding of state supported public welfare agencies and the work which they could accomplish. In this regard the beginnings established with the cholera epidemic became major factors in later social and political growth.[13]

The circumstances which favored epidemic cholera were precisely those circumstances most dangerous to society, and in turn the epidemic exposed urban rottenness and the subsistence life of a large segment of the cities' population. In Paris from 1817 to 1835 there was a gradual but steady increase in mortality percentages (31-34%), and mortality per 1000 population in the age group 20-39 went from 42 to 56.[14] These figures showed a pattern of urban dislocation which antedated the cholera, and the latter figures indicated that the sharpest and most continuous increase appeared in the most rapidly expanding urban age group, a group which also should have been best able to maintain life. In Chevalier's phrase, the statistics provide " the measure of a misery which, in certain epochs, surpasses the individual possibilities of physical resistance. . . ." [15] The cholera emphasized that continuing misery exacerbated the thinly veiled antagonism of the rootless populace and produced a striking surge in crimes of violence, popular unrest, and revolutionary action. Municipal administration failed to perform its proper functions, and popular resentment against officials increased as the failures multiplied. Paris literally could not bury her dead, and the frantic and ineffectual efforts to keep the streets from being strewn with corpses pinpointed the city's failure to absorb its ever growing population. In sum, " The cholera made precise the biological foundation of class antagonisms . . ." not only for the cholera years, but for preceding years as well.[16]

Growing urban dislocation was a factor in other major centers. In New York, although the problem was less critical than in Paris, similar patterns emerged. The poor suffered the heaviest cholera attacks, and, living in filthy, crowded rooms, they were the perfect victims. Con-

[13] For a brief note on the possibilities in this field, *see*: C. Fraser Brockington, " The cholera, 1831," *M. Officer*, 1956, 96: 75. A much expanded commentary is in David Eversley, " Le choléra en Angleterre," in Chevalier, *Le choléra*, pp. 157-188.

[14] Louis Chevalier, " Le choléra à Paris," in Chevalier, *Le choléra*, p. 6.

[15] *Ibid.*, p. 10.

[16] *Ibid.*, p. 13.

ditions in Bordeaux were little better, where narrow, dirty streets, and a floating, rootless population combined to produce a situation fitted for either disease or revolution. Writing about Lille, Monique Dineur and Charles Engrand summarized the cholera's importance for urban industrial centers:

> The cholera sharply accentuated the inequality before death which already existed in the city between the different social categories. It is not astonishing that the workers paid the heaviest tribute to the disease if one recalls the severe struggle they waged against appalling living and working conditions, against an insufficient, mediocre diet, unsanitary beyond belief, against privations multiplied by six years of economic crisis.[17]

Naturally, consequences flowed from these conditions. The " inequality before death " sharpened the differences between the classes, and in the cholera attack, class antagonism exploded. Among the well to do, the cholera was considered peculiarly the lower classes' property and, more than that, came to epitomize the popular threat to social stability. On July 10, 1832, New York's Special Medical Council announced that " the disease in the city is confined to the imprudent, the intemperate and to those who injure themselves taking improper medicines . . . ," and Mr. Rosenberg notes that it was believed that the same vices—intemperance, irregularity, and immorality—which doomed a man to poverty also made him cholera's chosen victim.[18] Parisian medical reports paralleled those of New York, linking poverty, indigence, cholera, and crime. One such report noted that " angry, discontented people, those occupied with sinister projects, those whom guilty ambition torments or who are devoured with remorse, are a target wholly designed for the disease." [19]

This was not only a matter of sin and indigence, however, for political issues were also involved, and in Europe the cholera became identified with political agitation. Carlist propagandists in France, ultra-conservative in their origin and outlook, " discovered " a correlation between liberalism's development and cholera's incidence. It was argued that the Polish revolution propagated the epidemic, for Nicholas I's troops carried cholera with them and infected the Poles. The latter, fleeing defeat and certain death, brought the disease to the West.[20] These ideas were not

[17] Monique Dineur et Charles Engrand, " Le choléra à Lille," in Chevalier, *Le choléra*, p. 95. On New York *see* Rosenberg, *op. cit.*, p. 39, and on Bordeaux, Freour, *op. cit.*, p. 545.

[18] Rosenberg, *op. cit.*, pp. 39-40.

[19] Chevalier, *op. cit.*, p. 16.

[20] On the other side, the Poles accused Nicholas I of purposely infecting them. " Europe is no longer ignorant of the ally which the Emperor of Russia has called to his assistance

the sole property of the ultra-conservatives, and even Louis Blanc wrote that ". . . attached to the Russians, it [the cholera] appeared with them on the battlefield of Poland, more murderous than the war itself. . . ." [21]

In many urban centers the poor responded in kind. To them the cholera was only another burden to be borne, yet a burden which the propertied classes forced upon them. They blamed the rich for their way of life and accused them of mass murder. The police felt the rising tide of popular antagonism, and police reports blamed the cholera for the recrudescence of radicalism and revolutionary spirit. The people built the myth that the mass deaths were not due to cholera, but were the outcome of a diabolical plot to poison the populace.[22] In Paris popular discontent flared in revolution on June 5, 1832, when General Lamarque's funeral became the occasion for a republican rising. The second cholera wave had only just passed, and the barricades went up in the very streets where the epidemic had recently claimed its victims.

In England, as in France, social disturbances followed the cholera, and class attitudes toward the disease reflected fundamental conflicts in society. The epidemic struck at a time when the Reform Bill of 1832 was passing through its final stages, and the cholera intensified those bitter social tensions which first helped Reform along its way, and then, as in the Fast Day riots, threatened to destroy it. Radical leaders attacked the government's special " cholera powers " as invasions of private rights and a thinly disguised assault on reform. The cholera itself was declared a chimera, " cholera humbug," and was written off as a bogey which the ruling classes foisted on the people. Medical men found themselves in the middle of a violent public controversy, for the radicals enthusiastically hailed each learned article disproving contagion or establishing the disease as " cholera nostras," while the government, faced with cholera's real

for the purpose of consummating the work of exterminating the Polish people. . . ." Francis Bisset Hawkins, M. D., *History of the Epidemic Spasmodic Cholera of Russia; Including a Copious Account of the Disease which has Prevailed in India, and which has Travelled under that Name from Asia into Europe*, London, 1831, appendix XXI, pp. 273-275.

[21] Chevalier, *op. cit.*, p. 16.

[22] The poisoning theme appears in almost every instance of the cholera epidemic. In Russia it became so serious an issue that it produced riots in St. Petersburg and panic in the environs of Moscow and affected the uprising in the Novgorod military colonies. *See* for example: "Graf A. Kh. Benkendorf o Rossii v 1827-1830," *Krasnyi arkhiv*, 1930, *38*: 135-137; "Graf A. Kh. Benkendorf o Rossii v 1831-1832," *ibid.*, *46*: 135-137; "Kholera v Moskve (1830): iz pisem Kristina k Grafine S. A. Bobrinskoi," *Russkii arkhiv*, Part III, 1884, pp. 136-151; "Lettres de Ferdinand Christin à une dame de sa connaissance," *Russkii arkhiv*, Part III, 1884, pp. 117-164.

menace, was equally anxious to fortify its public position with learned medical proofs. Behind this struggle lay the terrible facts of urban dislocation, the elements Chevalier called the biological foundation of social conflict, which emerged sharply with the cholera. In these respects the cholera in England followed the continental pattern, and "from the point of view of politics and the social sciences, . . . marks the opening of a new era." [23]

The cholera also played an important role in fostering health and sanitation reforms and therefore provides an important chapter in the history of public health. Marian Patterson points out that the story of public health in Canada is the story of the cholera, and this first major epidemic which Canada faced produced the first health boards, the first quarantine regulations, and the first organized efforts at public sanitation. In the same way, the cholera in New York produced cries for reform, and specific health and sanitation measures were taken to check the disease.[24]

David Eversley argues convincingly that the cholera in England produced the real beginnings of the sanitary reform movement, usually dated a decade and more later, and that the seed of both future public health policies and broad social reforms germinated during the first cholera epidemic. Edwin Chadwick's later work was influenced by his experiences during the epidemic, the statistical basis for later public health work was established, and the need for an expanded hospital and dispensary system was emphasized. Furthermore, certain elementary notions of sanitation were grasped, marshy areas were recognized as dangerous, as were rivers polluted with factory wastes.[25]

A by-product of the epidemic which was very important for future public health work was a marked increase in detailed statistical records. In Paris, for example, this statistical information included both figures in quantity and a highly detailed break-down of the city by streets, houses, and occupations. These statistics were compiled during the epidemic to forward much needed sanitary and urban development reforms, which, incidentally, only came with Louis Napoleon's Second Empire.[26] Chevalier used this material to complete a picture of the city in which the cholera centers could be definitively linked with living conditions.

[23] *See*: David Eversley, *op. cit.*, *passim* and especially p. 188.

[24] Marian A. Patterson, *op. cit.*, pp. 165-166; Rosenberg, *op. cit.*; C. A. Hutchinson, *op. cit.*, graphically describes the horrors of cholera in Mexico which pointed up the real need for advanced social and public health reforms.

[25] David Eversley, *op. cit.*, pp. 187-188.

[26] For the best recent treatment of Napoleon III's reforms in Paris, *see*: D. H. Pinkney, *Napoleon III and the Rebuilding of Paris*, Princeton, 1958.

This material is sufficiently valuable, both for type and content, to warrant a closer look. It is, of course, impossible in a short essay to detail this information, but some of Chevalier's conclusions can be summarized and should give an adequate sampling of the data.

First, the cholera evidence, taken by streets, proved misleading. Of 1292 Paris streets, 1105 reported cholera cases, which seemed to indicate that the cholera was a general phenomenon, affecting alike streets which were totally different in health conditions, ventilation, popular habits, and population density. This, however, was not the case, and further details pointed the fallacy. Chevalier noted that some houses reported up to 11 deaths and that these dwellings· in the words of the official reports, " were without exception situated in the worst quarters . . . or in the worst streets of the better quarters. . . ." The living conditions in these houses were worse than bad. The rooms—narrow, filthy, ill-ventilated—provided the persons who existed there with as little as 3 square meters of space each.[27]

Statistics which analyzed the cholera victims' occupations further developed the picture. Contemporary reports divided the working population into four classes, the liberal professions, the commercial professions, the mechanical, and " salaried " professions. The last two suffered most severely from the cholera, and the day workers absorbed the highest losses of all. These last were, in Hugo's phrase, " les misérables," the rootless ones, that growing accretion which urbanization deposited in Europe's great cities. They were those who lived in the tenements, who were responsible for the soaring crime rate, and who rushed to the barricades in the periodic upheavals that shook Paris. Their diet was as substandard as it was erratic, their dwellings crowded, noxious, wet, filthy, and in a grisly state of disrepair. Drunkenness was their sole escape, their only hope, and violence their main distraction. Medicine could not save these people, only sweeping reforms which would level the tenement walls, purify the water supply, let the sunshine and air penetrate the reeking fastnesses. The reforms were slow in coming, but come they did, and the first cholera epidemic played a major role in their development.

This brief survey suggests that the first cholera epidemic is an historical event worthy of further study. There are many problems still untouched.

[27] Chevalier, *op. cit.*, p. 37. It is impossible to reproduce here the sketch maps, tables, or even the detailed breakdown which Chevalier presents. It is enough to note that the areas of the city so affected are faithfully catalogued. To one personally unfamiliar with Paris' back streets, larger scale maps would have helpful, but the book's format clearly forbade such luxuries.

and some of these could provide important insights. Leaving aside the obvious opportunities to extend the analysis geographically, the cholera offers an admirable chance to study theories of causation and scientific method as applied in a specific situation. A voluminous literature, semi-popular and professional, exists on which to base such a study, and the results would advance our understanding of intellectual, and particularly scientific, development in the nineteenth century. Administrative history likewise could profit. Since governments took the initiative in handling the cholera, the epidemics provide case studies in administrative practice and an intimate view of governmental operation. Cholera's impact on diplomacy has never been assessed, even though it directly affected economic mobility and military strength. Finally, the cholera provides a further chance to study physiological concepts, theories of contagion, and therapeutic methods.

These comments are not meant to belittle the work already done, work which clearly indicates cholera's significance for social history. Mr. Rosenberg's thesis that the cholera in New York offers an opportunity "to discuss some of the ways in which one community attempted to fabricate a consistent conceptual apparatus with which to explain the inexplicable [and] provide security where there was only uncertainty" suggests an approach which relates disease directly to cultural currents and provides a mode of analysis which leads immediately into the role of ideas in human life. His emphasis on a retributive religious view, that sin and disease are linked, and his explanation of the counter-theme, that society itself bears responsibility and must take the burden of checking disease's ravages, provides a sharp insight into developing social attitudes.

In connection with this same point, Chevalier makes an important contribution. The idea that the cholera was a scourge of God brought upon man by his sins was foreign neither to Europe nor to England, and we have noted that in Europe, as in America, the upper classes could regard cholera as poverty's disease. Chevalier turned the proposition around, related the cholera to major demographic phenomena, and through his analysis identified the indigent urban population with a revolutionary element. This identification enables Chevalier seriously to qualify the interpretation that nineteenth century revolutions were bourgeois risings made in the name of liberalism, constitutionalism, and free trade. His demographic analyses show an endemic revolutionary situation in Paris, and he establishes that class tensions were rooted in the indigents' biology, the very struggle to exist. The cholera thus provided a case study in revolutionary conditions.

On a different level, Chevalier offers another important idea, and one which is implicit in several of the essays in his book. Epidemics, and perhaps other major calamities, do not create abnormal situations, rather they emphasize normal aspects of abnormal situations. Thus an epidemic intensifies certain behavior patterns, but those patterns, instead of being aberrations, betray deeply rooted and continuing social imbalances. Granting that this proposition is valid, disease in history appears in a different light. The grotesque and the horrible still exist, but they take on special meaning for they illumine latent or developing social characteristics.

Further assuming the validity of the proposition, its converse should also be true. Areas subjected to an epidemic and able to absorb it would suggest a fairly stable society. Mr. Rosenberg, for instance, notes that New York did not succumb to complete anarchy, and he points out that respectable people of regular habits felt they had little to fear from the disease.[28] Even more striking is a comment made by the Rev. Henry Whitehead in *The Cholera in Berwick Street,* (London, 1854), that even though the population was literally decimated, no panic occurred, a fact which the author found surprising, as he had " always heard and read that great pestilences were invariably attended by wholesale demoralisation of the population." [29] A comparison between this description and the reactions which followed the cholera in 1832 suggests a social change of major importance.

Another interesting variation on this thesis occurred during the Russian cholera epidemic of 1830-1831. Mme. Netchkina, writing in Chevalier's collection, emphasized the turbulence and conflict which followed the cholera into Russia. In explaining these conditions, she pointed to " The crisis in feudal society . . . [which] constituted the social foundation for the events described." And she went on to note that " The people's discontent caused by serfdom, discontent hidden for a long time, burst out when the epidemic battered the population." [30] Yet the Russian populace did not react uniformly, and there were wide variations from region to region. Some simply accepted the cholera as God's will, others fled infected cities, took refuge in the churches, or in quackery, while still others revolted.[31] During the Moscow epidemic of 1830, some 50,000 people fled the city, and the remaining populace showed signs of panic.

[28] Rosenberg, *op. cit.*, p. 39.

[29] Quoted in S. P. W. Chave, "Henry Whitehead and cholera in Broad Street," *Medical History,* 1958, *2*: 93.

[30] Netchkina, et al., *op. cit.*, p. 154.

[31] For a brief sketch of these reactions *see*: L. Pavlovskii, *Kholernye gody v Rossii,* St. Petersburg, 1893, pp. 58-61.

Yet there was no revolt, and Alexander Herzen, who experienced the epidemic, compared Moscow's resistance to the cholera with the heroic spirit which animated the city in 1812, and earlier, during the "Time of Troubles." [22]

When revolts did occur, the reasons for their outbreak were as various as the regions affected. In Sevastopol, fear of a cholera epidemic, combined with a new outbreak of plague, produced tighter quarantine regulations in May and June of 1830, and these in turn set off a bloody uprising in the Korabelnaia suburb directed against the police and the quarantine officials. Before the revolt was subdued on June 4, several officials, including the Military-Governor of Sevastopol, Lieutenant-General Stolypin, had been massacred, police posts and quarantine offices destroyed, and the quarter pillaged. The official account pointed out that though quarantine measures were undoubtedly salutary, the lower classes refused to believe that the plague existed, and they considered sanitary precautions useless and arbitrary. The fact of the matter was that the people had lived under quarantine for over a year, food was short, and living conditions abysmal. The intensified quarantine was simply too much, and the people rose.[23]

Though the cholera was not immediately involved in the Sevastopol uprising, the revolt is instructive. The refusal to believe in the existence of disease occurred several times both in Russia and abroad, and indeed this refusal helped produce the June, 1831, Haymarket uprising in St. Petersburg. The cholera epidemic was only in its first stages when the riots broke out, and the people's wrath was directed against foreigners, doctors, and the police. Some said the cholera was only a cover for a Polish plot to poison the population, while others accused the medical men of practising their black arts without regard for human life and for reasons known only to themselves. The riots were quickly subdued when Nicholas I himself appeared on the scene, and they did not break out again, even though some sections of St. Petersburg suffered horribly during the summer.[24]

Other rebellions of consequence occurred in the Novgorod military

[22] Alexander Herzen, *Byloe i dumy*, Leningrad, 1947, pp. 70-71.

[23] For the account, *see: Journal de Saint-Pétersbourg*, July 5/15, 1830, pp. 311-312. A brief description of the uprising appears in Th. Schiemann, *Geschichte Russlands unter Kaiser Nikolaus I*, vol. II, pp. 409-411. Father S. Gavrilov entered the quarter to calm the people, and his account may be seen in *Russkii arkhiv*, 1867, pp. 1375 ff.

[24] For an interesting summary account of the Haymarket rising, *see*: "Iz pisma V. A. Zhukovskago k Printsesse Luize Prusskoi," *Russkii arkhiv*, 1866, pp. 339-343. *See also*: Schiemann, *op. cit.*, vol. III, pp. 145-146.

colonies and in Tambov *gubernii*a. In the former case, the actual incidence of cholera was very light, and when the soldier-colonists made their protest, it was directed against their superior officers. Since the military colonies had been a source of disturbance since their inception under Alexander I, it may be safely assumed that the 1831 uprising, while immediately precipitated by the cholera, had its roots in existing social and economic problems. In the Tambov government, a serious uprising followed on a moderately severe attack. Between January 16, 1831, and September 30, 1831, some 5700 cases were reported for the entire government, with approximately 2300 deaths resulting. The revolt when it occurred was a spontaneous, popular outburst against police and quarantine officials who were able neither to stem the epidemic's march nor to win the people's confidence. The revolt required troops from the Vladimir and Voronezh governments to quell it, and the area remained under military occupation until 1833.[35]

From this brief survey it is quite clear that reactions to the cholera varied from section to section, and that generalization is extremely difficult. Certainly there is a degree of truth in Mme. Netchkina's assertion that the autocracy was incapable of aiding the population, and there is no question that the brutal and repressive means used to maintain the quarantine lines fostered resistance. Yet the fact remains that in many areas the people withstood both cholera's attack and the government's effort to protect them, and it can be concluded that only the searching analysis of individual cases can give the foundations for substantial generalization. It is in this area that further work needs to be done, and certainly the conceptual apparatuses offered by Rosenberg, Hutchinson, Eversley, and particularly Chevalier, provide a starting point.

As the cholera was a major demographic fact, so its study provides both an approach to basic problems in social history and the analysis of a causal force which itself affected social development. The work which has been done on the cholera marks only a beginning, and broad opportunities remain in this area where medical and social history meet.

[35] *See*: Pavlovskii, *op. cit.*, pp. 21-23; 34-35.

A POSTSCRIPT TO "MERREM'S YOUTHFUL DREAM"

OWSEI TEMKIN

In a previous article,[1] I suggested that the idea of pylorectomy as a cure for stenosis of the pylorus was conceived by Dr. Christian Friedrich Michaelis (1754-1814), physician with the Hessian troops during the Revolutionary War and eventually professor of surgery at the University of Marburg. I claimed that this idea had occurred to Michaelis while attending his friend, Dr. Peter Middleton, and that it was Michaelis who subsequently inspired his pupil, D. K. Ph. Merrem, to perform the experiments on dogs for which the latter is justly remembered.

There were, however, some gaps in the evidence for this thesis. In the first place, it seemed puzzling that a Hessian army doctor should be the friend of a notorious Tory who died in New York and also have connections with Philadelphia and with men like Redman, Rush, Shippen, and Kuhn.[2] Moreover, there was no proof that Michaelis actually had attended Dr. Peter Middleton in his last and fatal sickness.

I have now found that the latter point is definitely attested to by Dr. Middleton's will.[3] The abstract, printed in the *Collections* of the New York Historical Society,[4] shows the testament as dated "this First day of November, 1780."[5] A "Codicil," dated December 14, 1780, contains the following passage:

> And I leave mourning rings to Dr. [Jonathan] Mallet, and to Dr. Samuel Bard, and to Dr. Michalis [!] and Dr. Bayley, for their kind attentions during my painful and lingering illness.[6]

This makes it clear that Dr. Michaelis really was the "friend" of Dr. Middleton to whom Merrem refers.[7] As to Dr. Michaelis' relationship to

[1] Owsei Temkin, "Merrem's youthful dream; the early history of experimental pylorectomy," *Bull. Hist. Med.*, 1957, *31*: 29-43.

[2] *Ibid.*, p. 34 f.

[3] My attention was drawn to Middleton's will by the article in the *Dictionary of American Biography*, Vol. 12, New York, Scribner's, 1933 pp. 602-603.

[4] The New York Historical Society, *Collections for the Year 1901*. New York: Printed for the Society, 1902. The abstract of the will of Peter Middleton is to be found on pp. 20-22.

[5] *Ibid.*, p. 20.

[6] *Ibid.*, p. 21.

[7] Temkin, *op. cit.*, p. 33 f.

Philadelphia, I had previously overlooked an article by Whitfield Bell, Jr.,[8] which leaves no doubt about Dr. Michaelis' Philadelphia contacts. Michaelis is said to have approached General Washington as early as 1782 to obtain help for excavations in search of old bones.[9] At any rate, in 1783, Michaelis was in Philadelphia where he visited Dr. John Morgan who showed him his collection of mastodon bones.[10] It was his palaeontological work, I assume, which led to his subsequent election, on January 22, 1785, as a foreign member of the American Philosophical Society.[11]

Michaelis may be visualized as a German surgeon and scientist without deep personal involvement in the political events of the times. Thus he was able to befriend a Tory like Peter Middleton and to establish scientific contacts with men on the revolutionary side as soon as conditions permitted.

THE PHILADELPHIA JOURNAL OF THE MEDICAL AND PHYSICAL SCIENCES 1820-1827

CHARLES L. LOSACCO

The fervor of pride and spirit of nationalism that pervaded American feelings during the early formative years of the republic stirred physicians, as well as politicians, to patriotic gestures. If historians of the body politic have left these unsung, it is because they were overtones in the growth of professional activities and as such hold interest primarily for the medical historian. Nonetheless, physicians of the time felt the need to contribute to the new nation's prestige by the establishment of an American school of medical practice.

In 1820, Nathaniel Chapman, a Philadelphia physician who later became first president of the American Medical Association, founded the *Philadelphia Journal of the Medical and Physical Sciences.* This periodical, which represents the beginning of a continuing record of medical

[8] Whitfield J. Bell, Jr., "A box of old bones: a note on the identification of the mastodon, 1766-1896," *Proceedings of the American Philosophical Society,* 1949, *93*: 169-177.

[9] *Ibid.*, p. 172.

[10] *Ibid.*, p. 171 ff.

[11] *Ibid.*, p. 172, ftn. 15; see also *Year Book 1958* of the American Philosophical Society Philadelphia, 1959, p. 99, where Chr. F. Michaelis is listed among the former foreign members.

practice in America, has received scant attention. Landis gives a brief résumé of the historical facts surrounding its life, and Ebert notes its significance in the evolution of the American medical periodical.[1,2] Dr. Chapman had been goaded by Sidney Smith's criticism of American culture in the *Edinburgh Review* and offered his periodical as a reply and partial refutation of Smith's criticisms.[3]

On the title page of the first number of the *Philadelphia Journal* a quotation from Smith's article appeared as a motto: " In the four quarters of the globe, who reads an American book? or goes to an American play? or looks at an American picture or statue? What does the world yet owe to American Physicians or Surgeons? " In the " Prospectus," which followed, Dr. Chapman answered that portion of Smith's inquiry directed to medicine by pointing out that the current medical literature of Europe was describing doctrines and modes of practice which had been adopted there after long usage in America. Elsewhere in the " Prospectus " the periodical medical journal was described as the ideal medium of professional communication in America. A general statement of editorial policy showed how Dr. Chapman intended to lend substance to this ideal. In part it read:

> . . . our leading aims, will be to trace the progress of medicine in the United States, to vindicate our claims to certain improvements, to preserve these, as well as what may hereafter be done, from foreign usurpation, and lastly to evalue, and stimulate the genius of the country to invigorated efforts, by holding out a respectable and more permanent repository for its productions.

Finally Dr. Chapman invited all relevant communications and constructive criticisms. With reference to the latter, he emphatically stated that any criticisms based on bias, prejudice, or personalities would be ignored. In the light of later medical developments, the most significant and far-sighted editorial policy appeared near the conclusion of the " Prospectus." Here Dr. Chapman wrote that in addition to medical matters the Journal would welcome and publish communications regarding experiments and discoveries in the physical sciences; especially those that held promise of application to the practice of medicine. The current dependence of medical practice upon the physical sciences is testimony to Dr. Chapman's far-sightedness.

[1] H. R. M. Landis: *The History of the Development of Medical Science in America as Recorded in the American Journal of the Medical Sciences.* Philadelphia and New York: Lea Brothers & Co., 1901, p. 4.

[2] Myrl Ebert: " The rise and development of the American medical periodical 1797-1850." *Bull. M. Library A.*, 1952, *40*: 243.

[3] Frank Luther Mott: *A History of American Magazines, 1741-1850.* New York, London: Appleton, 1930, p. 566.

Dr. Chapman was sole editor of the *Journal* from its inception in 1820 until 1825. At this time, under the pressure of other interests, he prevailed upon two other physicians, Dr. William P. Dewees and Dr. John D. Godman, to join him on the editorial staff.[4] Dr. Dewees was a pioneer in the practice of obstetrics by physicians—an interest he shared with Dr. Chapman, who in 1810 had held the post of assistant to the first Professor of Midwifery at the University of Pennsylvania Medical School.[5,6] Dr. Chapman's interest in this specialty was mirrored in his lead article, "Nourishment of the foetus," in the first number of the *Philadelphia Journal*.[7] Dr. Godman had been first editor of the *Western Quarterly Reporter of Medical Surgical and Natural Sciences* which had first appeared in Cincinnati in 1822.[8]

Dr. Chapman's name continued to appear as senior editor on an editorial board composed of the three men. Almost all editorial duties, however, fell to Dr. Godman.[9] In February 1827, Dr. Isaac Hays joined the editorial staff.[10] He had begun his medical training in 1817 as a pupil in the office of Dr. Chapman and had received the degree of Doctor of Medicine from the University of Pennsylvania in 1820.[11]

Between 1820 and 1827 the *Philadelphia Journal of the Medical and Physical Sciences* published fourteen volumes of two numbers each. Issues appeared quarterly in November, February, May, and August. Each issue was divided into a number of sections. Articles appearing for the first time were separated from those reprinted in whole or in part from other sources. Subject matter covered the gamut of medical interest, though some subjects appeared much more frequently that others. Much space, for example, was devoted to analysis of epidemics and recommendations for their control and prevention. Toxicology, medical jurisprudence, obstetrics, and gynecology, attracted a great deal of interest. This interest represented a departure from medical attitudes of the day—for example, that obstetrics was the proper practice of midwives rather than physicians.[12] Discussion of materia medica, and especially extraction of new drugs from vegetable forms, occupied a significant amount of space in the journal.

[4] *Ibid.*
[5] Thomas McRae in *DNB*, *s.v.* "Dewees, Wm. Potts."
[6] Charles H. LaWall in *DNB*, *s.v.* "Chapman, Nathaniel."
[7] I, p. 1.
[8] Wm. Snow Miller in *DNB*, *s.v.* "Godman, John Davidson."
[9] "A semi-centennial retrospect." *Am. J. M. Sc.*, 1877, n.s. *74*: 311.
[10] *Ibid.*
[11] Thomas McRae in *DNB*, *s.v.* "Hays, Isaac."
[12] Thomas McRae in *DNB*, *s.v.* "Dewees, Wm. Potts."

Lengthy review articles, each of which discussed diagnosis, treatment, and prognosis of a single disease entity, appeared very frequently. An early interest in surgery is reflected in the content of articles that deal with this phase of medical practice. The design of extirpating instruments for use in tonsillectomies and consideration of absorbable sutures are subjects of prime interest.[13] From time to time, hospitals and asylums for the insane were discussed in a tone that encouraged establishment of such institutions in the infant Republic.[14] Physical science played a relatively minor role in the editorial content of the journal; in 1821, however, chemical tests for metallic poisons were published as part of an article on poisoning.[15] The professional tone of the writing in the journal emphasized the need for fundamental understanding; and hypotheses and theories were advanced and argued over, although much empirical art was also included.

A section entitled " Medical and Philosophical Intelligence " was devoted to abstracts of items of medical interest published elsewhere. Sources were given sketchily, and the reader would have been hard put to to trace the origin of most of the abstracts. The section remained an important part of the *Journal* under various names until 1825 and served various functions during its life-span.[16] Announcements of officers of medical societies appear here as well as names of the graduating classes of medical schools. At other times it served as a medium of direct communication with readers. For example, in 1823, a physician in Cincinnati inserted an appeal to other physicians in the western country for clinical data garnered from their respective practices.[17]

An editorial section entitled " To Readers and Correspondents " made its first appearance in the second issue, February 1821.[18] In this first appearance and again in 1826, the editor states refusal to print contributed articles because they aim at criticism of personalities rather than rational dissemination of knowledge.[19] Comments regarding the status of medical education in the United States, as well as favored policies, also appear here. The editor also inserted announcements of changes and innovations to appear in the *Journal*. For example, in 1822, the section informed readers of the *Journal*'s intent to publish tables of mortality of large cities in the United States.[20] These tables appeared in the next issue. In the issue for May 1823, " To Readers and Correspondents " announced the publication of a new medical journal at Hartford, Connecticut, and re-

[13] I, p. 17.
[14] III, p. 383, IX, p. 30; I, n. s., p. 225.
[15] III, p. 193.
[16] IX, (Feb., 1825).
[17] VI, p. 190.
[18] I, p. 443.
[19] III, n. s. (March, 1826).
[20] IV (August, 1822).

publication of a London medical journal in New York.[21] The latter was, according to the announcement, a flagrant instance of pirating, a practice which was soundly denounced. However, the publication was recommended as a worthy one. Announcements of new books and of sessions of the Medical School of the University of Pennsylvania appeared in the section.

A new series of the *Journal* was begun in May 1825, concurrently with the appearance of the names of Drs. Dewees and Godman as members of the editorial staff.[22] With minor changes the *Journal* continued in its established pattern. "To Readers and Correspondents" announced expansion of the *Journal*'s European contacts and promised fuller coverage of developments from that continent's medical centers. The "Intelligence" section became the "Quarterly Periscope," divided into two sub-sections: "European Intelligence" and "American Intelligence." "European Intelligence" became "Foreign Intelligence" in the issue of May 1827.[23] The "Periscope" continued to carry abstracts, as well as all items that could be categorized as medical news: announcements of new books and medical school sessions, lists of medical school graduates, and the mortality tables. "To Readers and Correspondents" continued to carry comments by the editor and announcements of manuscripts which had been contributed for publication. Occasionally it offered apologies for being unable to print certain manuscripts because they conflicted with editorial policies.[24] Illustrations were limited to a few well executed engravings. The only advertisement that one can be reasonably sure was paid for appeared in the issue of February 1824.[25] Two pages advised the practicing physician of drugs and supplies available from a store in Philadelphia. The second issue of each volume concluded with an index to the volume.

Toward the end of 1827 Dr. Godman left Philadelphia to assume the professorship of Anatomy in Rutgers Medical College in New York, and Dr. Hays became editor of the *Journal*. One of his first acts as editor implemented his decision, with the publishers, to begin a new series under a new name; thus, in November of 1827, the *American Journal of the Medical Sciences* was founded.[26] This familiar periodical has appeared continually from the press of the same publisher ever since.

[21] VI (May, 1823).
[22] I, n. s. (May, 1825), title-page.
[23] V, n. s., p. 141 (May, 1827).
[24] III, n. s. (May, 1826).
[25] VII (Feb., 1824).
[26] Frank Luther Mott, *op. cit.*, p. 567.

CORRESPONDENCE AND REPORTS

BERNARD GORDON MANUSCRIPTS IN THE UNITED STATES

In compiling a check-list of medieval medical manuscripts in North American libraries, I encountered, in reports from librarians, statements suggesting the uniqueness of their Bernard Gordon manuscripts. Furthermore, there seems to be a widespread unawareness of the existence of Gordon manuscripts in America. For example, one librarian was of the opinion that manuscripts of this physician "are rare: none are listed in De Ricci's *Census*[1] as being in America, and not many are quoted by Thorndike and Sudhoff as being in European libraries."[2] As a matter of fact, both the *Census* (p. 2010) and the catalogue of the Osler Library at McGill University (*Bibliotheca Osleriana* Ms. 7523) list a fourteenth century Latin manuscript of Gordon's *Lilium medicinae*. Osler bequeathed this manuscript to the Library of the College of Physicians of Philadelphia. A slip in the front of the manuscript suggests that it was the only example in the United States and Canada. This unwarranted assumption was based on the fact that it was the only Gordon manuscript listed in the *Census*. Whatever may have been the situation at the time of the publication of the *Census*, at present there is a surprising total of eleven Gordon manuscripts in North America, and all of them are in the United States.

Of the six manuscripts of Gordon's *Lilium medicinae*, a seven-fold textbook of practical medicine organized in typical medieval head-to-feet order, four are in Latin. In addition to the Philadelphia holding mentioned above, there are three manuscripts in the National Library of Medicine (now at Cleveland). One is a fourteenth century manuscript,[3] and another is a fifteenth century manuscript (Schullian 498). The third manuscript in the National Library of Medicine (Schullian 507) appears to be a fifteenth century fragment of the *Lilium* added to the *Practica* of Giovanni da Pergola. There are also two fifteenth century manuscripts of the *Lilium* in Hebrew. The Boston Medical Library has one of these,[4] and the other is in the private collection of Dr. Lyle M. Sellers of Dallas, Texas.

[1] Seymour De Ricci and W. J. Wilson: *Census of Medieval and Renaissance Manuscripts in the United States and Canada* (New York: H. W. Wilson, 1935-7).

[2] More than fifty Gordon manuscripts are listed in Lynn Thorndike and Pearl Kibre: *A Catalogue of Incipits of Mediaeval Scientific Writings in Latin* (Cambridge, Mass.: The Mediaeval Academy of America, 1937), and at least thirty are mentioned in Karl Sudhoff: "Zur Schriftstellerei Bernhards von Gordon und deren zeitlicher Folge," *Sudhoff's Archiv für Geschichte der Medizin und der Naturwissenschaften*, 1917, *10*: 162-188.

[3] Dorothy M. Schullian and Francis E. Sommer: *A Catalogue of Incunabula and Manuscripts in the Army Medical Library* (New York: H. Schuman, 1951), Ms. 497.

[4] James F. Ballard: *A Catalogue of the Medieval and Renaissance Manuscripts and Incunabula in the Boston Medical Library* (Boston: Priv. print, 1944), Ms. 16.

The Boston Medical Library also has three other Bernard Gordon manuscripts: a fifteenth century Hebrew version of the *De phlebotomia* (Ballard 16); a fifteenth century Hebrew version of the *De prognosticis* (Ballard 17); and a work in Latin entitled *Tabula ingeniorum* (thirteenth to fifteenth century, Ballard 18) describing ten methods for curing diseases. The recently established Lawrence Reynolds Library of the Medical Center of the University of Alabama at Birmingham has Gordon's *De conservatione vitae humanae* in a fourteenth century manuscript. It comprises four short treatises entitled *De flobotomia* (different from Gordon's *De phlebotomia* mentioned above), *De urinis*, *De pulsibus*, and *De regimine sanitatis*. The New York Academy of Medicine possesses two fourteenth century leaves of the *De conservatione vitae humanae*. Communications from readers about additional Gordon manuscripts in the United States and Canada will be gratefully received.

THOMAS HERNDON

Editorial

It is with great regret that the *Bulletin* records the death on January 6, 1960, of Dr. Wyndham B. Blanton, a member of its Advisory Editorial Board.

Born in 1890, in Richmond, Virginia, Dr. Blanton was the author of three volumes on the history of medicine in Virginia and of numerous historical articles and reviews. He was the chairman of the committee responsible for the local arrangements of the thirtieth annual meeting of the American Association for the History of Medicine, held at Richmond and Williamsburg, Virginia, May 6-8, 1957, in connection with the celebration of the 350th anniversary of the settlement of Jamestown.

ANNOUNCEMENTS

AMERICAN ASSOCIATION FOR THE HISTORY OF MEDICINE

Thirty-Third Annual Meeting: Charleston, S. C., March 24-26, 1960. Headquarters hotel: The Francis Marion Hotel.

NATIONAL NEWS

American Academy of the History of Dentistry

At the annual meeting, Sept. 10, 1959, at New York, Van B. Dalton was installed as president, Harry B. McCarthy chosen as president-elect, and E. D. Coolidge elected vice-president. Milton B. Asbell and George B. Denton were re-elected secretary and editor respectively.

American Institute of the History of Pharmacy

"The great pharmacist-chemist Carl Scheele," an address with 20 slides (2 x 2) prepared with the collaboration of George Urdang and Ernst W. Stieb, tells in word and picture something of the life and work of the Swedish chemist Scheele, who is sometimes referred to as "the greatest pharmacist of all time." The 20-slide talk, with text based on Urdang's biography of Scheele, is loaned to Institute members ($5 annual dues) without charge, or may be purchased from the Institute, 356 Chemistry Building, Madison 6, Wisconsin.

Grants

Ann Beck, Ph. D., has received a grant-in-aid of research from the American Philosophical Society to complete a study of the influence of British colonial policy on the advancement of science and medicine in the dependent areas during the twentieth century.

North Carolina

The James B. Bullitt Medical History Society of the University of North Carolina began its fifth year of activity with a meeting at the home of Dr. Warner Wells who spoke to the group on "Dutch influence on Oriental medicine." The society, originated by students interested in medical history, is composed largely of students and faculty members of the School of Medicine, but is open to others in the university community. Faculty sponsors are Dr. Warner Wells, associate professor in the department of surgery, and Dr. Charles Hooker, chairman of the department of anatomy. Programs are arranged by a student chairman, this year by David Bruton. The society is named in honor of Dr. James Bell Bullitt, an active and interested member of the group, whose special interest is the medicine of the Bible.

U. C. L. A. Traineeships in Medical History

Two pre-doctoral and one post-doctoral traineeships in Medical History are available annually for award by the Division of Medical History, University of California at Los Angeles. Pre-doctoral traineeships range between $3,000 and $3,500 in value, post-doctoral traineeships from $4.500 and $5,000. Trainees will be associated with the Division of Medical History in the School of Medicine and will work with Professors C. D. O'Malley and A. Rupert Hall. They will be required to engage in a definite course of historical research, as well as taking such courses as may seem advisable for them. The study of any topic in the history of medicine or of fields of science allied to medicine may be pursued. Pre-doctoral trainees will be expected to become candidates for the award of a higher degree; details of the available program will be sent on request. Trainees are also invited to participate in the general activities of the Division of Medical History. Applications for traineeships (which may be renewed after one period of tenure) should be addressed to Drs. O'Malley or Hall at the Division of Medical History, School of Medicine, University of California, Los Angeles 24, California. They should include a statement of age, transcript of record, proposed research topic, experience or qualification to undertake this research, one letter of recommendation and the names of two persons to whom reference may be made.

Applications must be received not later than *March 15, 1960.*

University of Illinois

The 1960 D. J. Davis Memorial Lecture on Medical History will be given at 1:00 p. m., March 30, 1960, in Room 221 of the Dental-Medical-Pharmacy Building of the University of Illinois, 1853 West Polk Street, Chicago 12, Illinois. The Lecturer will be Barry J. Anson, Ph. D., Chairman and Robert Laughlin Rea Professor of the Department of Anatomy, Northwestern University Medical School, Evanston, Illinois. His subject will be "Mediaeval Medicine: Pre-Christian Fabric and Present-Day Remnants."

Yale School of Medicine Sesquicentennial

The Yale School of Medicine will celebrate a century and a half of existence on October 28 and 29 of this year. The occasion will be marked by meetings, exhibitions, and addresses suitable to the occasion. Among a notable group of guest speakers will be Sir Howard Florey of Oxford, England. Complete details of the program will be announced later. Other events associated with the sesquicentennial celebration will take place during the academic year 1960-61. These include an exhibition of medical art at the Yale Art Museum and a scientific meeting to be held in conjunction with the dedication of a new medical school auditorium.

In October 1810 the Connecticut General Assembly granted a charter to Yale College for the establishment of the Medical Institution of Yale College, and the fifth medical school in the United States came into being. The first medical faculty at Yale was a notable one, containing Eneas Munson, foremost authority on Materia medica, Nathan Smith and Benjamin Silliman, still counted among Yale's greatest, Eli Ives and Jonathan Knight, leaders in medicine and each to

become President of the American Medical Association. From the start the Connecticut Medical Society was a partner in the enterprise and worked in close cooperation during the entire first half century of the School's existence.

PROGRAMS OF MEETINGS

Johns Hopkins Medical History Club

March 4, 1960: "Medical Care of the Future Viewed in Historical Perspective," George A. Silver.

Benjamin Waterhouse Medical History Society

January 18, 1960: "Henry Gray, M. D.," Kenneth C. Morley, Jr.

February 15, 1960: "Early Attempts to Prolong Life," Gerald J. Gruman.

Society of Medical History of Chicago

January 13, 1960: "History of Dermatology on Postage Stamps," Samuel M. Bluefarb; "Maimonides," Samuel J. Zakon.

February 17, 1960: "Evolution of Quackery," Morris Fishbein; "The Historic Importance of the McCormick Institute for Infectious Diseases," Frederick Stenn.

NEWS FROM ABROAD

Canada: Osler Society, McGill University

During the academic year 1958-59, the Society held five meetings, and prizes for the best papers were awarded to the following students: R. Fortuine (President of the Society), D. Cowan, and J. Rosenberger.

International Congress of the History of Medicine

The Seventeenth International Congress of the History of Medicine will take place September 4-14, 1960, in Athens and Cos under the presidency of Professor Aristote P. Couzis (honorary president) and Professor Sp. Oeconomos, 3, rue Grivéon, Athens (Greece). The following subjects will be discussed. 1. Hippocrates and his school, 2. The school of Alexandria, 3. Byzantine medicine, 4. Varia (which must relate to Greek medicine). Those wishing to present papers should write to Professor Basile Malamos, Homère, 54 Athens, or to the Secretary General of the International Society, Professor F. A. Sondervorst, 124, Avenue des Alliés, Louvain (Belgium).

Israel

Dr. Suessman Muntner, of Jerusalem, has been appointed as Visiting Professor of the History of Medicine at the Hebrew University, and Dr. Joshua Leibowitz, of Jerusalem, as Clinical Associate Professor of the History of Medicine.

BOOK REVIEWS

HILDING BERGSTRAND: *Svenska Läkaresällskapet 150 År.* Dess Tillkomst och Utveckling. Stockholm: 1958. 562 pp. Ill. 50 Sw. Crowns.[1]

The Swedish Medical Society had its modest beginning in December, 1907, when seven prominent Stockholm physicians, headed by the chief surgeon of the Serafim Lasaret as president, came together to formulate plans. Jöns Jacob Berzelius was also a member. Earlier attempts had been made to form such a society, the first in 1792 by four Stockholm physicians, but it only lasted two years. There was a scientific society to which doctors were admitted, but the membership was limited and the number of physicians increasing, so that by 1806 they numbered sixty. In 1802, Eric Gadelius and Berzelius appealed to the king, Gustaf IV Adolph, for sanction to obtain medical literature by forming a reading society. The king, fearful of the influence of the teachings of the French revolution, had enacted stringent regulations regarding importation of foreign literature. A letter from a doctor in Uppsala to a colleague in Göteborg lamented: "Am as starved as I can possibly be for something to read. In a whole year I have received nothing from England, and in a year and a half nothing from the continent."

The shadow of Napoleon was creeping over Europe, and the nations of the north took sides as best they could. England ruled the seas, harassed shipping and communication. On Feb. 21, 1808, Russia issued an ultimatum to Sweden that she join the allies in a war on England or take the consequences. On that very day the Russian forces marched across the Finnish border. The members of the medical society decided that they soon would have other things to do and postponed the final organization for another year. Sept. 17, 1809, Sweden gave up her rights to Finland and other possessions, losing about one third of the dominions which had been united to her for 600 years. A German statesman at the time said: "Sweden lies in her deaththroes, and she should be permitted to die in peace." Meanwhile, Russia was preparing to invade Sweden proper. The leading nobles, seeing that the situation was desperate, banished the vacillating king and his family from the country forever. A new constitution was drawn up, a constitution, next to that of the United States, the oldest still in force. People longed for a leader of the old type, especially a strong military man. Prince Christian August of Denmark seemed to fulfil these desires, but he died suddenly, the blame for his death being laid to Count Axel von Fersen, Swedish hero from the American War of Independence. Count Fersen was murdered in dastardly fashion while riding in the funeral procession of Christian August. This gruesome deed is mentioned to point out that anarchy was raising its ugly head, for not a hand was raised to protect the Count. The game of intrigue went on and had a most unexpected out-

[1] Dr. Bergstrand also wrote a Summary of this book in *Medicinhistorisk Årsbok* (Yearbook of Medical History), 1958, joint effort of the Swedish and Danish medical history societies. Wolfram Kock is the Swedish editor and Egill Snorrason of Copenhagen the Danish editor. This article has also been used in the present review.

come. The choice of one of Napoleon's marshals, Count Bernadotte of Ponte Corvo, as Crown prince and regent, and his unanimous election at Örebro on August 21, 1810, is of the stuff of which fairytales are made. Says a Swedish historian: "The royal election at Örebro is like a saga adventure, and never did mere chance play a greater part in the disposal of a crown." [2]

Meanwhile, a month after the loss of Finland, the medical society met on Oct. 3, 1809, to vote on the program of future work. It was decided to keep the country and the medical profession up to date on medical developments through lectures, books, pamphlets, and demonstrations. Such a post-graduate program has ever since been the aim of the society.

At this time the long-honored humoral pathology still occupied men's minds—the idea that disease was caused by a disturbance of the harmony of body fluids, a disturbance which, in the case of epidemics, might be caused by changes in temperature and the presence in the atmosphere of a mysterious substance, miasma, a contaminating element. However, the idea of contagion was also present. The very first pamphlet isued by the society, Jan. 1809, warned the public against dangerous, contagious fevers. One should suppose that such a publication would do away with old ideas, but when cholera arrived in Europe in 1830 there was bitter contention, even within the society, between miasma and contagion camps. One of the opponents of the miasma theory was Berzelius who, in an anonymous paper in 1834, unqualifiedly took his stand with the contagionists; so strong. however, was the cultural inheritance that even as late as 1855 quarantine was considered useless.

Bichat's "C'est toujours le solide qui joue le principal rôle dans la maladie" (quoted from Bergstrand's summary), anticipating cellular pathology, as well as Jenner's triumph against smallpox, served to gradually undermine the long reign of humoral pathology.

Meanwhile the medical society went steadily forward as a living and active component of daily life. Yearly publications were greatly treasured by the doctors in the provinces. In 1839, a new journal, the celebrated *Hygiea*, was launched by the society and attained a respectable age of one hundred years. In 1939, an age-long dream of collaboration among the Scandinavian countries was realised in the publication of *Nordisk Medicin*.

The organization of a library for members of the society was difficult in the early days on account of political conditions and the lack of space. Denmark-Norway was forced to take the side of Napoleon, England and Sweden against. Danish and French books were forbidden, but no one hesitated to take advantage of the black market for those as well as English books. In 1811, the society subscribed to 11 periodicals; to 17 in 1813; at the present time to 162. Collection of books increased more rapidly than available space, but a large number was taken over by the Karolinska Institut which, always in close and friendly contact with the medical society, has had a branch library at its disposal on the society's premises since 1947.

The country-wide influence of the society was early noted by the ruling powers and received their approval and support. The first token was a franking privilege, a large item in the budget, as well as compensation for duties now in the hands of the Public Health Administration. As late as 1911-12, the society compiled official

[2] Clason, S.: Sveriges historia, vol. XI, p. 176.

statistics of causes of death and the nomenclature of diseases. In its early days the society also informed the public directly on matters pertaining to public health, a task now taken over by the state. Between 1831 and 1908, it published no less than 12 pamphlets and broadsides regarding cholera. The last one was written by the society and published by the state.

The greatest influence of the society on questions of public health, however, has been the shaping of public opinion. One of the questions debated was the spread of syphilis in wartime, as when Denmark in 1808 declared war with subsequent enlistment of 100,000 men, practically without sanitary service, following the Russian invasion of Finland. A special committee was formed by the society to work out a circular for the country's doctors, pointing out the symptoms and ravages of syphilis. This took the shape of a pamphlet of 150 pages printed by the state.

Attacks against the regulation of prostitution began in England in 1875. The medical society, asked for an opinion by public officials, came out strongly for regulation in 1880, 1888, and 1907. In 1903, the king had a committee organized to review the whole matter; its conclusions were submitted to the medical society for debate. This resulted in the most elaborate and heated discussions ever heard in the society, with a protocol of 550 pages. Regimentation was sanctioned, but with a large minority against, which minority later won out.

Tuberculosis was for a long time the most common disease. After the discovery of the bacillus, in 1882, a series of discussions took place in the society, one outcome being that King Oscar II turned a bequest to him from the Swedish people over to a committee for the construction of sanatoriums.

Another subject dear to the heart of the society was medical education. Looking into the records one is surprised to find early suggestions for reform, several of which have only been realised in our own time. In 1889, Gustav Retzius criticised the 11-year requirement of study for a doctor's diploma. He also underscored the necessity of opening the Stockholm city hospitals for bedside instruction.

As pointed out in the beginning, however, the main purpose of the society was to keep members and doctors all over the country aware of new discoveries and improvements in treatment. As time went on, sections were formed to work independently of general meetings. Gynecology and Obstetrics constituted the first section. There are now 34 sections, taking more and more the character of what we call symposia.

In 1943, physicians in Lund and Malmö (southern part of Sweden) suggested the society should arrange a yearly congress when all sections should meet, and which should be open to all northern countries. This has been realized since 1943, with the exception of 1946.

As the renown of the society grew with the years, bequests for continuance of the good work came in from private persons and business firms. This made possible the establishment of foundations for the granting of scholarships, travel, research, prizes—now worth ca. 2,574,000 crowns. The society also has been the recipient of donations to ease the burdens of physicians and their families in time of distress. In 1947, this foundation had at its disposal 4,341,000 crowns.

Finally, the society has been a rallying point where generations of physicians have made personal contacts, leading to mutual help and life-long friendships.

The society started with the lucky number seven. It now has more than three thousand members.

The author has avoided mere compilations. He points out that the work of the society during the past twenty years alone would have occupied practically all the space given to this summary of the work of 150 years. It has been a tremendous job. The author has sketched the story of the various epidemics; blood letting; tuberculosis and venereal diseases during the early years. In a section entitled "Scientific content of the meetings of the society 1939-1957," he has outlined the advances of modern medicine, including aviation medicine. The book makes fascinating reading, and many of the sections should be translated. There is an index of personal names, but no subject index. There is, however, a detailed list of contents. The illustrations are likenesses of honorary members of the society, its officers and members. There are reproductions of old texts, reprints of letters and broadsides.

On the first of October each year an anniversary meeting is called to order when the secretary presents plans for the coming sessions. Outsiders who have done or are doing outstanding work are invited as lecturers. During the years 1946-47 no less than twenty-seven foreign visitors participated: nine from the United States, two from England, five from Switzerland, one each from France, Belgium, and Austria, three from Russia, and five from other northern countries.

During the 150 years of its existence the society has bestowed honorary fellowships on sixty of its own members and fifty on outside men most of whose names are known to us without titles and initials.

ANNE TJOMSLAND

ERWIN H. ACKERKNECHT. *A Short History of Psychiatry.* Translated from the German by Sulammith Wolff. New York and London: Hafner Publishing Company, 1959, vi + 98 pp. Ill. $3.50.

This book has the kind of compactness and craftsmanship which we associate with a small European car; and it also lacks the expanse, the luxury, and the frills of a really big automobile. In less than one hundred pages, Ackerknecht presents a general survey of the evolution of psychiatry from "ethnological comments" on the role of insanity, sanity, and the medicine men among primitive peoples to "the newer somato-empirical treatment methods." Obviously, some facts, phases, and aspects had to be left out. Thus, the book reflects the author's "down to earth approach," which he ascribes to Nasse: Ackerknecht concerns himself only with "medical psychiatry," since in his opinion "philosophical psychiatry" has never been of much help in practice; and he limits himself to the writings of a few men of particular importance, although he is no supporter of the "great men" theory in history. Despite these restrictions, the small volume contains an amazing amount of important detail and concise evaluations of the socio-cultural influences upon the trends in psychiatric thinking. The chapters on "Renaissance Psychiatry" and "The Theory of Degeneration" are excellent. The personality, the achievements, and shortcomings of some great psychiatrists are characterized with judicious clarity, especially those of Esquirol and Griesinger. Perhaps the

least convincing chapter is the tenth: "From Neurology to Psychoanalysis." Ackerknecht feels that as a historian he can hardly say anything of value about this period, as it is too close in time to him. Throughout the book, the author speaks his mind forcefully, and this makes the book and its readers, especially those who will disagree with him, all the more alive. For example: Ackerknecht does not share the opinion that the unbelievable contradictions in Paracelsus' writings are a sign of greatness and depth of understanding; to him it is a "simpler and more obvious explanation" to assume that Paracelsus was "completely muddled and illogical."

Or: "Phenomenological psychiatry is of most significance for those with a philosophical bent of mind."

Or: "The fact that in some countries psychoanalysis became a substitute religion . . . with all its paraphernalia such as pia exercitia (training analysis) etc., is a curious phenomenon which had, however, occurred before in other scientific movements, for example in Darwinism."

One misprint (p. 67) may be mentioned: Kraepelin died in 1926, not 1928.

The author states in his preface: "To write the history of psychiatry is an unrewarding task"; yet, this reviewer is convinced that Ackerknecht, in preparing and writing his book, has had his reward already. After all, in his own words, "psychiatry has always been in many ways the most human and most interesting of the medical sciences." There is little doubt that he will harvest another reward also: his book will be read, not only because it is short, but because it turned out to be good.

WALTER O. JAHRREISS

KENNETH J. FRANKLIN (Translator). *The Circulation of the Blood.* Two Anatomical Essays by William Harvey together with nine letters written by him. Springfield, Illinois: Charles C Thomas, 1958. xxiii + 184 pp. Ill. $4.50.

"Anyone who reads Harvey, and so has access to the thoughts of one of the world's really great men, becomes lifted above himself." This is not mere eulogy. Nor is it just a translator's apology for Englishing writings which have been Englished before (as if an apology were needed!). It is a gracious acknowledgment of the magnitude of a man by a later compatriot and fellow-scholar.

The book opens with a "Biographical," cleanly and concisely composed in nine pages of print—more would have been superfluous; fewer, inadequate. In them one renews one's acquaintances with many of those whose lives and teachings influenced, or accompanied, or followed the discovery of the circulation of the blood: Fabricius of Aquapendens, the Kings James I and Charles I, des Cartes, Riolan the Younger, Primrose, Hoffmann, Ent, Highmore, Scarborough, and the rest.

The work proper is composed of translations, "slightly annotated," of letters written by Harvey to friends and dissidents. The translations have been done in the finest tradition of British scholarship and are followed by a most carefully edited reprinting of the Latin text as written by Harvey. The present reviewer is slightly saddened by the use of *ae* for the ligatured diphthong *æ*, but otherwise is happy.

The first letter was written to Caspar Hoffmann, once of Nuremberg, then of Altdorf—that Hoffmann who illustrated so dramatically and so effectively the obstinacy of human ignorance and of human intolerance by refusing to acknowledge the validity of Harvey's thesis even when Harvey himself demonstrated this in Hoffmann's own laboratory and before Hoffmann's very eyes.

There follow the two *Anatomical Essays* addressed to Riolan the Younger, which together give the volume its title, *De Circulatione Sanguinis.* These two *Essays,* which show so incontrovertibly the truth of Harvey's doctrine, show other things also. In the first place they show the great dignity of the man himself: repeatedly he addresses Riolan as "most learned" and "most distinguished," just as he had addressed Hoffmann (and one wonders upon what grounds) as his "learned and fair-minded friend." In the second place they show, perhaps even more lucidly than does the *De Motu* itself, the completely selfless objectivity of this man. His humility in his approach to *things* reminds one strongly of the attitude of the philosophers, astronomers, mathematicians, and artists of the pre-Periclean times of ancient Greece toward the sanctity of fact as against tradition, prejudice, and presupposition. And in the third place, on the other hand, they give more than mere glimpses of the awesome fastnesses of the so-called Aristotelianism, the pseudo-Galenism, the unreasoning dogmatism, which Harvey and a few others had to confront. It is well to remember that Aristotle had divided the higher animals into the two classes, emprosthouretic and opisthouretic; that later Aristotelians taught that woman, being opisthouretic, is therefore inferior to man; that the Aristotelians of about Harvey's time refused to peer through Galileo's telescope because they knew the sun showed no spots—had not the Philosopher himself taught that sun was composed of the quintessence and therefore was incorruptible? It is well to remember that Riolan said that if discoveries at dissection disagreed with what Galen had written, it is because the human body has changed since Galen's time, but one should not admit that Galen was in error (and Harvey addressed this same Riolan as "most distinguished and most learned!"). It is well to remember that della Torre thought it scandalous in Harvey to attempt to destroy so many magnificent theses and succulent dogmas; and that Patin labelled Harvey's doctrine "paradoxical, useless, false, impossible, absurd, and harmful."

It is well to remember also that Parisanus still was "demonstrating" the passage of the blood through the septum of the heart in 1635, as was Caecilius Folius, of Venice, in 1639. So also was Gassendi in 1640. Hoffmann died in 1648, still denying the fact that the blood circulates. And Riolan the Younger was denying it still when he died in 1657, nearly thirty years after Harvey's *De Motu* was published!

The essence of Harvey's answer to all of these opponents is typically and laconically British: he is not interested in Galen, but in the truth.

This, then, is a book which should be in the library of every man of medicine. But it should be also in the library of every man and woman concerned with greatness in the human spirit, in whatever field greatness may be manifested. For the lover of books, it is a masterpiece of the book-maker's art, with colored and half-tone and line illustrations, with title-pages in red and black, and with back and fore-side stamped in gold. For the scholar Franklin has provided the complete Latin text, while his own "slight" annotations, gracefully made and most illuminating, are worth far more than the prolix discussions one usually encounters.

One should add to this volume Franklin's scholarly edition of the *De Motu* itself (1957), and complete his collection with Leake's more virile, but no less scholarly, edition of the latter.

G. KASTEN TALLMADGE

GEORGE E. ARRINGTON, JR. *A History of Ophthalmology.* (MD Monographs on Medical History, Number Three). New York: MD Publications, Inc., 1959. xvii + 174 pp. $4.00.

Frequently, specialized historical monographs of the medical arts are regrettably nothing more than a recital of discoveries and accomplishments without embodying underlying philosophy. In this book, attention is centered on the philosophical approach and the correlation of the science with the history of civilization.

The text is well organized, concise, and covers the long vista of many centuries, from the dim obscure dawn of medicine to the "ascendancy of modern ophthalmology." Briefly presented are studies of the history of ophthalmology covering prehistoric, Hindu, Egyptian, Hippocratic, Aristotelian, and Hellenistic times. The culture and beauty of the Roman and Greco-Roman age and its influence on the medical specialties are discussed. There are biographico-historical observations about Celsus, Pliny, Galen, the early Christian era and Islam. Pseudoscientific knowledge of the Middle Ages is reviewed. There is an appraisal of the contributions of that gifted pantologist of the Middle Ages, Roger Bacon, and the story of Leonardo da Vinci the most extraordinary, versatile genius of the age of geniuses, the Renaissance, is unfolded. The ensuing eighteenth century is approached, when the medical man began to reveal "nobility in his self-assurance and pride in his new knowledge," and when historical patterns of interaction began to produce increased activity in the ophthalmological field. Undoubtedly, at that time, improved methods of transportation, communication and mechanization contributed markedly to the tremendous increase in workers and in scientific attainments. In the nineteenth century, ophthalmology became fully emancipated from general medicine and surgery, proceeding as an independent branch of medicine and assuming scientific characteristics principally through the efforts of the Göttingen and Vienna schools.

Dr. Arrington acknowledges Descartes as the discoverer of the law of refraction. Although this is a moot point in some texts, still his study of optics did lead to the independent discovery of the fundamental law of reflection: that the angle of incidence is equal to the angle of reflection. His essay on optics stands as the first published statement of this law. Unrecognized is the importance of the nineteenth century rediscovery of the mydriatic action of belladonna and hyoscyamus which became such a helpful tool in the examination of the interior of the eye.

The volume is one of a series of MD monographs under the editorial direction of Dr. Felix Marti-Ibanez, who has written an appropriate foreword, a discussion of the symbolism of the eye in religions. An interesting feature near the end of the treatise is a chronological table listing leading eye specialists with their major contributions and writings, correlating them with the onward march of civilization. A directory of periodicals, societies, and associations in the ocular field is included.

This condensed history of the progress of ophthalomogy presents all the main facts in systematic order, avoiding, as much as possible, prolixity or unnecessary discussion of the merits of men and theories, and not laying any claim whatever to the title of an exhaustive treatise. Yet there is presented much of the earliest and greatest, and much of the latest and best.

Dr. Arrington wisely places emphasis on accomplishments in the realm of ophthalmological methods and their relationship to science, philosophy, and cultural development. It is a rather fresh approach, appealing not only to students of the history of medicine but to practising physicians interested in the origins and expansion of medical thought. The volume should be a welcome addition to the libraries of all who have a sense for the philosophical implications of medical research. It has neither the magnitude nor the extent of many of its predecessors in this field, but both in content and method it exhibits uniqueness in its analysis of ophthalmological history. It is a book which shows every sign of care and thought in its preparation and includes a galaxy of timely axiomatic remarks which can surely add to our stock of coveted lore.

PAUL TOWER

WILLIAM CARLETON GIBSON. *Young Endeavor*. Contributions to Science by Medical Students of the Past Four Centuries. Springfield, Illinois: Charles C Thomas, 1958. xx + 292 pp. Ill. $6.50.

"Young Endeavor" is a fascinating study of the lives of medical students and their scientific contributions over the past four centuries.

Medical students have made fundamental discoveries in anaesthesia, anatomy, bibliography, cardio-vascular system, chemistry, digestion, endocrinology, infection and pathology, lymphatics, the nervous system, and optics. Some like Cotugno came from poor homes, others like Helmholtz had the guidance of a teacher, still others like Carrion had no special direction; many were unpopular like Freud at the General Hospital in Vienna, a few had odd behavior patterns like Semmelweis; most continued into adulthood what they had begun in student years, like Haller with his literary interest; a rare one like Darwin began with medicine and ended in pure science. Whatever the circumstances were, all these young people had in common: curiosity, enthusiasm, and industry. Many examples illustrate the occurrence of scientific maturity at a very early age. Humphrey Davy, for instance, discovered the anaesthetic properties of nitrous oxide when he was nineteen years old. William T. G. Morton used ether in his experimental studies on gold-fish, puppies, worms, and caterpillars long before he demonstrated the effectiveness of ether as an anaesthetic at the Massachusetts General Hospital in 1846. Crawford Long, too, tried ether on himself and his medical student friends prior to his graduation in Philadelphia in 1839. Vesalius was a student at Paris when he searched the Cemetery of the Innocents at Montfaucon for anatomic material, this knowledge supplying him in part with material for the great *Fabrica* which he completed at the age of 28. In 1662 Borelli asked his 19 year old medical student, Lorenzo Bellini, to dissect a deer: Bellini discovered the kidney tubules which bear his name. Henry Gray published his monumental

Anatomy, Descriptive and Surgical at the age of 32, but only after elaborate dissections on many animals, a study undertaken in his earliest student days. Long before he made his discoveries in the prevention of hospital gangrene, Joseph Lister attained eminence as a microscopist doing fundamental studies on the human iris. While an undergraduate student at Montpellier, Conrad Gesner conceived the idea of his *Bibliotheca Universalis*, a gigantic effort to catalogue all books written in Greek, Latin, and Hebrew. Daniel Drake published his famous "Climate and Diseases of Cincinnati" five years before he took his medical degree at Philadelphia. Looking back upon his graduation thesis of 1860, John Billings wrote, "there was nowhere in the world a library which contained all medical literature," and it was this experience which led him to prepare "a comprehensive catalogue and index." The Army Medical Library and the *Index Catalogue* are his monuments. August Waller was a first year medical student at Paris when he observed the passage of blood cells through the walls of capillary blood vessels and three years later announced the momentous discovery of the nerve cell and its fibre as an autonomous unit. Thomas Lewis penned the classical *The Mechanism of the Heart Beat* when he was 29 years old. Paul Ehrlich was 23 when he outlined his theory of histological staining. Franz Donders was an undergraduate in chemistry when he wrote "Determinate quantities of movement, heart, light, electricity, magnetism, and nervous force respond to each other, and can pass from one into the other." Data like these show that schools should provide opportunities for student expression and encourage the students to play more than a passive role. Students should be exposed in addition to the influence of the most inspiring teachers like Carl Ludwig or Sir Charles Sherrington. Professor Gibson feels that overloading our undergraduates with detail may have a suppressive effect, but urges that by providing them with an experience in research and keeping them informed of the great achievements of young investigators we shall go far in increasing our medical effectiveness.

FREDERICK STENN

WALTHER RIESE. *A History of Neurology* (MD Monographs on Medical History, number two) New York: MD Publications, Inc., 1959, 223 pp. $4.00.

The title of this book is somewhat misleading, as it does not present the events and personalities concerned in the development of knowledge of the nervous system, but is rather a discussion of neurological philosophy from ancient times to the present. Hence some knowledge of neurology and medical history are prerequisites to its full appreciation. As Professor Félix Martí-Ibáñez states in his foreword, "Dr. Riese has sailed across the high seas of history, always guided by the compass of philosophy." For the specialist in this field the voyage is delightful, but the novice, at times, may find himself fogbound in rather heavy seas.

In this small, well printed monograph the author discusses the general theories of nervous function, the development of the concepts of nerve impulse, reflex action, pain, cerebral localization, and holistic functioning of the nervous system. Brief chapters on the diagnosis, prognosis, and therapy in neurology complete the text. There are appended tables of personalities in neurology, neurological journals, and societies.

The account of the development of the doctrine of cerebral localization is perhaps one of the best chapters of the book. The author traces the ideas regarding mind and brain from Greek and Roman times to the present. The irregular progression of the doctrine of cerebral localization is often not fully appreciated. Although the scientific evidence for focal representation of function in the brain was well established shortly after the middle of the last century, the author points out that many facets of the problem, even the central ones of aphasia, apraxia, and agnosia, were controversial issues well into the twentieth century. In this discourse, the thesis that nervous function progressively shifts towards the rostral pole, thus endowing the frontal lobe with the representation of "intelligence," is propounded. Perhaps the role of the temporal lobe in higher mental activities, being so recently elucidated, could not be expected to be included in this discussion.

The author's background as a medical historian and as a neurologist trained in European centers gives him a somewhat unusual perspective of neurology. Thus, in his discussion of reflex activity, several pages are devoted to Marshall Hall's views, while Sherrington's contributions are disposed of in a few lines. The elaboration of neurological semiology in the nineteenth century in France, England, and Germany, which is usually emphasized in historical accounts of neurology, is barely mentioned.

For the advanced student of neurology and medical history this is an interesting and challenging account of the development of neurological principles.

A. Earl Walker

THE BULLETIN RECENTLY RECEIVED *

Alfonso A. Castaño Almendral. *La obra quirurgica de Bartolome Hidalgo de Agüero.* Salamanca, 1959. (Publicaciones del Seminario de Historia de la Medicina de la Universidad de Salamanca, Serie A, Estudios, Tomo II, Num. 6, pp. 255-307.)

Lawrence Babb. *Sanity in Bedlam*: A study of Robert Burton's *Anatomy of Melancholy.* East Lansing, Mich.: The Michigan State University Press, 1959, xi + 116 pp. $5.00.

Hamilton Bailey, and W. J. Bishop. *Notable Names in Medicine and Surgery.* Springfield, Ill.: Charles C Thomas, 1959, xiii + 216 pp. Ill. $7.50.

Luigi Belloni. *Da Asclepio ad Esculapio.* A ricordo di Guido Baccelli promotore dei Congressi Nazionali di Medicina Interna. Per il LX Congresso della Società Italiana di Medicina Interna. Roma XIX-XXI Ottobre MCMLIX. 31 pp. Ill.

Emiliano Hernandez Benito. *La oftalmologia española del siglo XVIII.* Sala-

* The *Bulletin* reserves freedom of decision as to the publications to be listed in this section. Items received, other than those assigned for review, are ultimately incorporated into the collection of the Institute of the History of Medicine.

manca, 1959, 37 pp. Ill. (Estudios de Historia de la Medicina Española, Universidad de Salamanca, nueva serie, Tomo I, Num. 2.)

Robert Bradlaw. Gaudeamus igitur. (First Menzies Campbell Lecture Delivered at the Royal College of Surgeons of England on 23rd July 1959.) Reprinted from *Annals of the Royal College of Surgeons of England,* 1959, *25*: 209-224.

Kate Cumming. *Kate: The Journal of a Confederate Nurse.* Edited by Richard Barksdale Harwell. Baton Rouge, La.: Louisiana State University Press, 1959, xx + 321 pp. Ill. $6.00.

Herbert M. Evans (Editor). *Men and Moments in the History of Science.* Seattle: University of Washington Press, 1959, viii + 226 pp. Ill. $4.50.

Franz Hermann Franken. *Das Leben grosser Musiker im Spiegel der Medizin: Schubert, Chopin, Mendelssohn.* Stuttgart, Germany: Ferdinand Enke Verlag, 1959, 100 pp. DM 12.

William Gilbert. *De Magnete.* Translated by P. Fleury Mottelay. New York: Dover Publications, Inc., 1959, liv + 368 pp. Ill. $2.00.

Luis S. Granjel. *Vida y obra del Dr. Cristobal Perez de Herrera.* Salamanca, 1959, 33 pp. Ill. (Estudios de Historia de la Medicina Española, Universidad de Salamanca, nueva serie, Tomo I, Num. 1.)

Institute of Basic Medical Sciences. *Annual Report 1958.* London: Royal College of Surgeons of England, 33 pp.

Medical Department, United States Army. *Tabulating Equipment and Army Medical Statistics.* By Brig. Gen. Albert G. Love, USA (Ret.), Col. Eugene L. Hamilton, MSC, USAR, and Ida Levin Hellman, M. Sc. Office of the Surgeon General, Department of the Army, Washngton, D. C., 1958, x + 202 pp. Ill. $2.00. [For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.]

Genevieve Miller. *The Adoption of Inoculation for Smallpox in England and France.* Philadelphia: University of Pennsylvania Press, 1957, 355 pp. Ill. $6.00.

Marvin K. Opler (Editor). *Culture and Mental Health;* Cross-Cultural Studies. New York: The Macmillan Co., 1959, xxi + 533 pp. $8.75.

The President's Review, including "A Quarter Century in the National Sciences" by Warren Weaver, from The Rockefeller Foundation Annual Report, 1958. New York: 49 West 49th Street. 168 pp. Ill.

Charles Singer. *From Magic to Science.* Essays on the Scientific Twilight. New York: Dover Publications, Inc., 1959, xxxi + 253 pp. Ill. $2.00.

CONTRIBUTORS TO THIS NUMBER

GEORGE H. A. CLOWES, JR., M. D., is Associate Professor of Surgery, Western Reserve University School of Medicine, Department of Surgery, Cleveland Metropolitan General Hospital, Cleveland, Ohio.

HAROLD FEIL, M. D. is Clinical Professor Emeritus of Medicine, School of Medicine, Western Reserve University, Cleveland, Ohio.

THOMAS HERNDON, M. A., is a research assistant in medieval medical history in the University of North Carolina. His address is History Department, The University of North Carolina, Chapel Hill, North Carolina.

WALTER O. JAHRREISS, M. D., The Seton Psychiatric Institute, 6420 Reisterstown Road, Baltimore 15, Maryland.

CHARLES L. LOSACCO, M. Sc., is Associate Medical Writer in the Department of Coordination, Sterling-Winthrop Research Institute, Rensselaer, New York.

R. E. MCGREW, Ph. D., is Associate Professor of History, College of Arts and Science, University of Missouri, Columbia, Missouri.

VICTOR A. MCKUSICK, M. D., is Associate Professor of Medicine, The Johns Hopkins University, School of Medicine, Baltimore 5, Maryland.

FRANZ ROSENTHAL, Ph. D., is Louis M. Rabinowitz Professor of Semitic Languages, Yale University, New Haven, Connecticut.

FREDERICK STENN, M. D., is Assistant Professor of Medicine at Northwestern University Medical School. His address is 6400 South Kedzie Avenue, Chicago 29, Illinois.

G. KASTEN TALLMADGE, A. M., M. D., Ph. D., is Professor, and Director of the Department, of the History of Medicine in Marquette University, Milwaukee 3, Wisconsin.

ANNE TJOMSLAND, M. D., resides in Putnam Valley, New York.

PAUL TOWER, M. D., is engaged in the practice of Ophthalmology. His address is 2007 Wilshire Boulevard, Los Angeles 57, California.

A. EARL WALKER, M. D., is Professor of Neurological Surgery, The Johns Hopkins Medical School, Baltimore 5, Md.

CARL J. WIGGERS, M. D., Sc. D., is Professor Emeritus in Physiology, School of Medicine, Western Reserve University, Cleveland, Ohio, and Honorary Professor, Frank E. Bunts Educational Institute, Cleveland, Ohio. His address is 1360 Cleveland Heights Boulevard, Cleveland 21, Ohio.